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The Barnhart Technical Gas Analysis.

[A Description of Apparatus Used and Methods Employed by the Maryland Steel Company.]

The importance of gas analysis as a factor in the efficient operation of industries, either using or producing gas, has been frequently discussed, and is becoming more generally appreciated. The demand for simpler and more rapid methods of gas analysis, sufficiently accurate for technical work, has led to the invention of several forms of apparatus which give excellent results, and requiring the minimum amount of time, energy and manipulative skill.

It is the object of this paper to present an improved form of apparatus which has proved an invaluable part of the equipment of a laboratory where the subject of gas analysis requires much of the routine as well as the research work of the analyst. While the apparatus described may appear quite elaborate and complicated in construction, it embodies the essential features of an equipment necessary for the execution of rapid and accurate work, although requiring comparatively little manipulative skill and experience.

Some of the subject matter of this paper is not new, as the original form of this apparatus was designed for use in the laboratories of the Maryland Steel Company several years ago, and it was briefly described at that time. It may be said that the general form of the apparatus has not been altered, but many details have been developed which have added much to its value. Of course, it is not recommended for use in laboratories where the first cost of installation must be considered or where portability is essential. The apparatus as installed is mounted on a table of suitable size to accommodate it, and kept distinctly separate from other laboratory equipment. The frame supporting it is made of mahogany, covered on top with a thin-sheet rubber composition. The jacketed burette is supported in the center of the frame, the several pipettes being arranged in circular fashion about it, supported by the receiving flasks and held in position by their attachment to the burette. The burette, with a capacity of 105 c.c., is graduated by 1/10 c.c., having a reading range from 105 at the bottom to 50 at the top, and it is fitted with a stopper about 1 inch in diameter, ground to fit the neck of the burette at the top, but reduced in area at the lower part of the neck, leaving an annular space of about 1 m.m. wide. Fused into the neck, at the top of the annular opening, are 8 capillary tubes of 1 m.m. bore, to which 7 pipettes are attached by means of heavy rubber tubing. In the early form of apparatus a stopcock was used in the top of the burette, which served to control the communication between it and the pipettes, which arrangement, being of no particular advantage, as each pipette has a stopcock controlling its operation, it was changed for the arrangement above described, which is preferable as it simplifies manipulation. The stopper, when covered with a good coating of stopcock lubricant, remains in its proper position, unless undue pressure is exerted on the gas in the burette; but, as a precaution against its being forced out of position and broken, it is held in place by looping a rubber band over it and around one of the capillary tubes. The eighth capillary serves as a communication between the apparatus and the supply from which gas to be tested is drawn.

The first pipette on the left is the oxygen and hydrogen generator, and is connected with electric lighting circuit. A current of about 3 amperes is required for this generator. Arranged in order are the pipettes for the absorption of carbon dioxide, oxygen illuminants, and carbon monoxide, the next being a pipette for generating pure hydrogen; and, finally, the explosion pipette.

As before stated, a mixture of pure oxygen and hydrogen H_2O is obtained by the decomposition of weak solution of sulphuric acid. This is used for raising the calorific power of explosion mixtures to a predetermined standard, and is preferable and more convenient than the use of oxygen in explosive mixtures. For the absorption of oxygen either phosphorus or pyrogallol may be used, a special pipette being provided for this purpose. The former has the disadvantage of being a rather dangerous reagent to handle, and often becomes coated with a deposit from illuminating gas which renders it inactive. The latter reagent in time will etch the glass sufficiently to cause the stopcock of the pipette to leak. An attempt was made to use chromous chloride for oxygen absorption, the reagent being prepared by the reduction of a solution of chromic chloride by metallic zinc. This solution is a very energetic reducer, removing as much as 20 c.c. of oxygen on one passage of air through it; but the attempt to use it as a reagent for gas analysis was given up, as decomposition appeared to take place, rendering it unsuitable for the purpose. For the estimation of illuminants bromine is preferred.

When carbon monoxide is determined by absorption, as in the analysis of coal gas, two solutions of cuprous chloride are recommended. The greater percentage of the constituent is removed by an ammoniacal solution. The gas is then passed into an acid solution which removes the ammonia and the remaining carbon monoxide (as completely as is possible by absorption). When the estimation of carbon monoxide by explosion is preferable, as is the practice with gas which does not contain hydrocarbons other than methane, except in small quantities, the ammoniacal cuprous chloride solution is dispensed with and a hydrogen generator substituted. For this purpose either

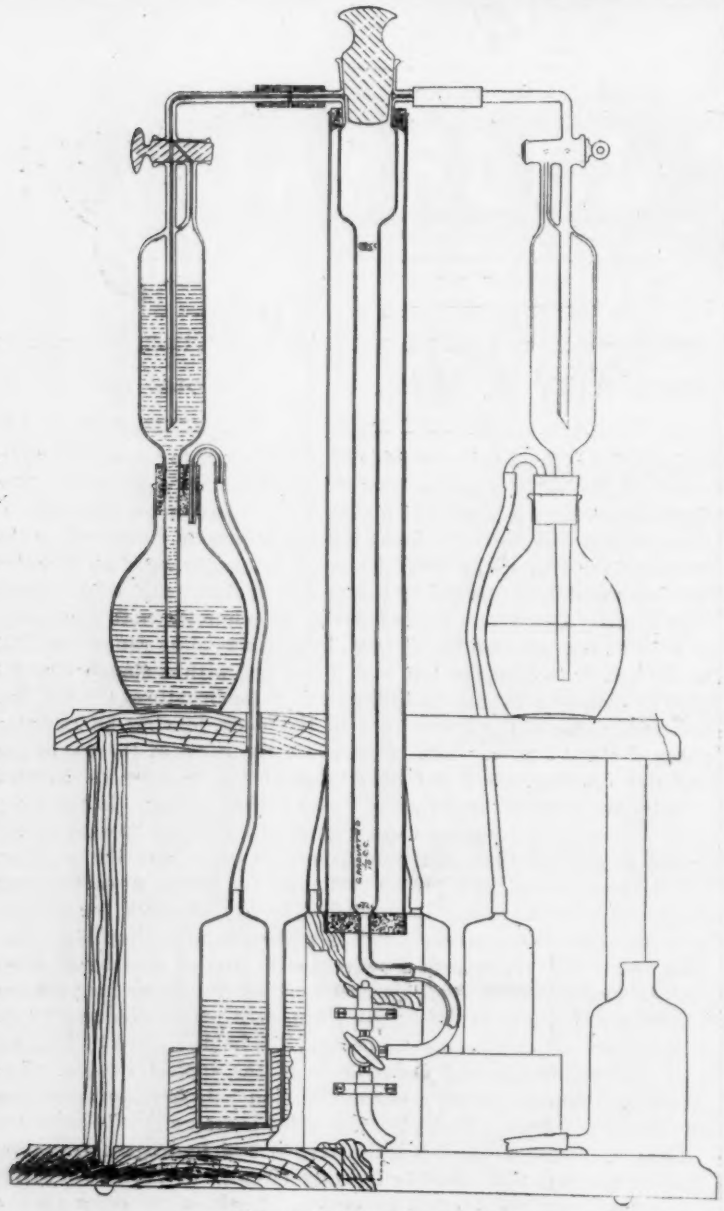


Fig. 1.—Elevation Arrangement.

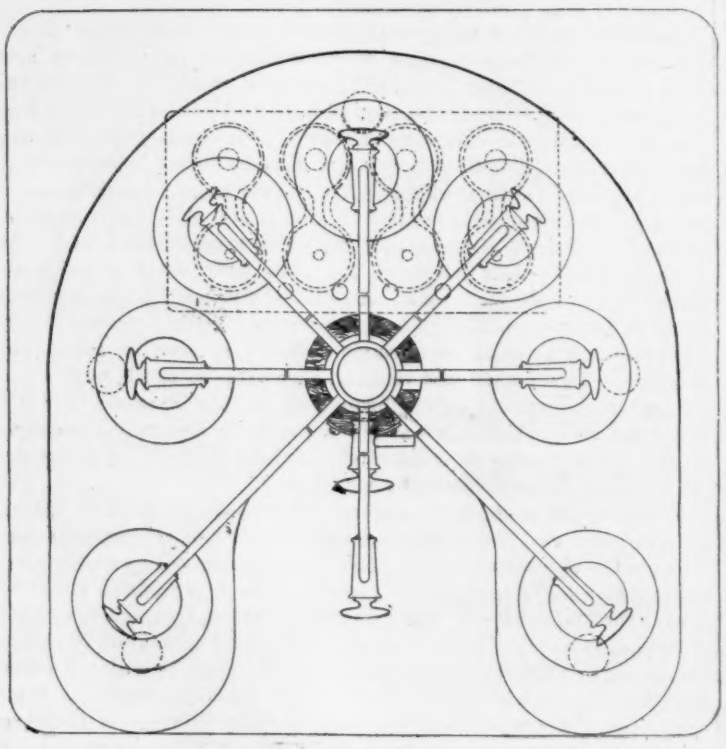
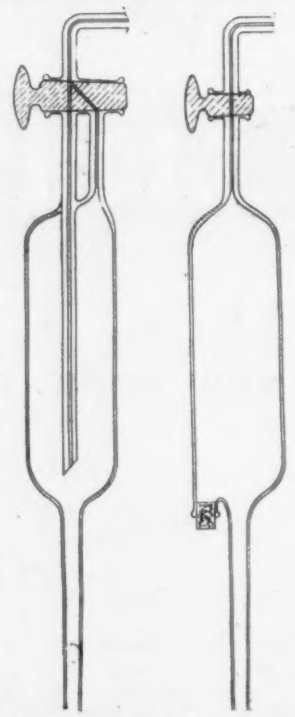
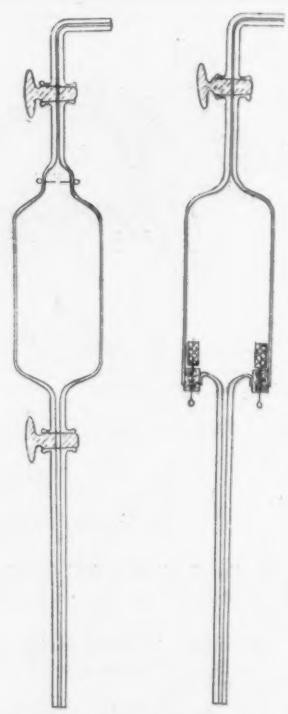


Fig. 2.—Plan Arrangement.



Pipette for Liquid Reagents. Pipette for Solid Reagents.

Fig. 3.—Section through Reagent Pipettes.



Explosion Pipette. Oxygen-Hydrogen (H_2O) Generator.

Fig. 4. Section through Explosion and Generating Pipettes.

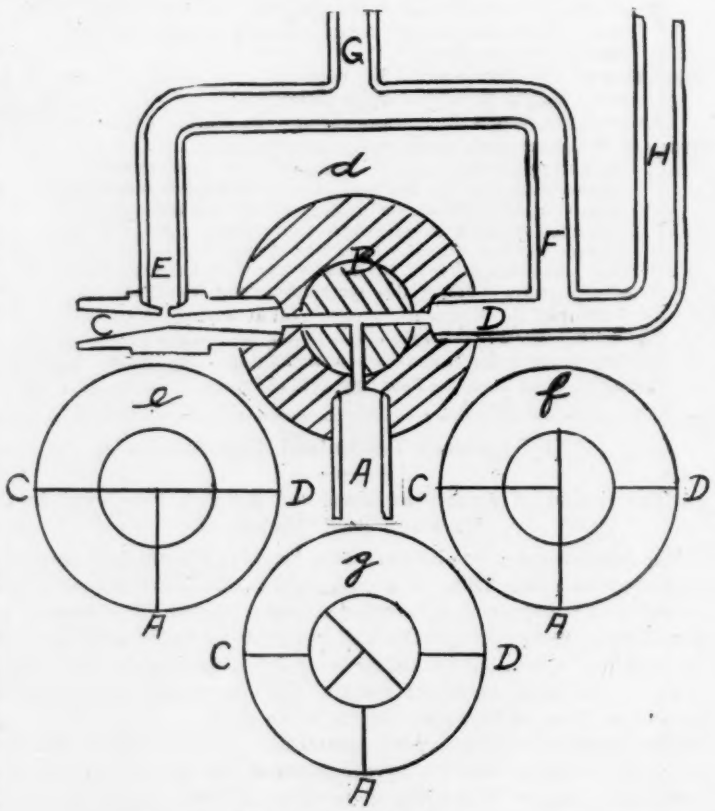


Fig. 5 —Diagram of Aspirator.

a phosphorus or a liquid reagent pipette may be used by inserting these strips of pure sheet zinc into the pipette and filling the receiving flask with dilute sulphuric acid.

The explosion pipette conforms with the other pipettes in its shape and arrangement. The pipette has a capacity of about 150 c.c., and its communication with the burette and the receiving flask may be cut off by means of the 2 stopcocks. Communication with the latter, however, is left open, relieving the shock of the explosion by allowing the gas to expand and force the confining liquid into the flask. After explosion the partial vacuum caused by condensation is relieved by allowing the liquid to rise in the pipette, and water is used as the

confining liquid, prepared in the usual manner. The protection of reagents from oxidation by contact with the atmosphere is accomplished in a neat manner by connecting the receiving flasks with a set of U-tube seals, which are held in position by a wooden rack and located beneath the support for the receiving flasks. These seals are preferable to the rubber bags generally used for the purpose, in that they are automatic in their action, allowing air to enter into the receivers until an atmosphere of nitrogen is obtained. The unique feature of the apparatus is the permanent attachment of 7 pipettes to the burette, so as to eliminate the necessity of changing apparatus during the process of analysis, and also an arrangement which permits of no error due to unfilled capillary space. In the renewal of reagents the pipette is not necessary. The liquid is allowed to flow into the flask which is detached by means of the rubber stopper. The flasks have a capacity of nearly 500 c.c., reducing the frequency of renewal. The method of passing the gas through the reagent affords a most rapid means of absorption.

It may appear that this apparatus is quite delicate and fragile, making it unsuitable for general work, especially in regard to the burette and its stopper and capillary tubes. In reference to this we may state that the burette of the original apparatus of this type was in daily use for over 5 years, being finally set aside for the improved form.

A novel appliance used in connection with apparatus is a compressed air aspirator for the movement of the gas, instead of the usual method of raising and lowering of the aspirator bottle. The device as shown consists of a 3-way cock, *B*, in connection with an ejector, *C*, which is manipulated as follows: When the cock, *B*, is in the position shown in *d* or *e*, air, at a pressure of about 12 inches (mercury), enters through the tube *A*, and flows to *D* and *C*, causing a pressure at *E*, and a partial vacuum at the opening to *E*, the resultent pressure in *C* being about 2.5 inches, which is transmitted to the confining liquid in the burette by means of the tube *G* leading to the aspirator bottle. When the cock *B* is in the position shown in *f*, the communication between *A* and *D* is closed, while the air continues to flow through *A* to *C*, causing a vacuum of about 2 inches in *E G*. When the cock *B* is in the position shown in *g*, the communication of *A*, with both *C* and *D*, is cut off, and atmospheric pressure is transmitted to the confining liquid in the burette through *C*, *E*, *G*. The manometer, *H*, indicates the pressure or vacuum applied. For the reduction of the pressure in *A* to the desired constant head, a small double diaphragm governor is used.

The action of the aspirator is entirely under control of the operator and is extremely sensitive. The gas or confining liquid may be moved at any desired speed, or brought to rest at will. The relation of the areas of the openings in cock being once established, and the pressure in *A* adjusted, the device requires no further attention. The burette readings are taken in the usual manner. The cock being in the position shown in *g*, the aspirator or leveling bottle is raised until its water level coincides with the water level in the burette. While the application of the aspirator is in no way essential to the use of this apparatus, it has proved a decided improvement over the usual method of manipulation, especially in apparatus of this type, where the constituents of the gas are removed by successive washings by passing it through the reagent.

In the analysis of combustible gases particular attention has been given to the establishment of a standard for explosive mixtures in regard to composition, volume and calorific power. To determine the respective relation of these, certain sets of experiments were made with gas mixtures of known composition.

The attachment of the explosion pipette to the burette permitted of the use of larger volume of gases to be used in explosion than was possible with the Hempel pipette, as formerly used. In the former apparatus and methods about 12 c. c. of illuminating gas was used.

The new apparatus permits of the use of 18 c. c. and 105 c. c. of air. With the above volumes an explosive mixture of about 100 B.T.U. per cubic foot is obtained, and a surplus oxygen content of about 3 per cent. In the analysis of gases of lower calorific power the mixture is enriched by the use of electrolytic gas prepared as previously described.

The following data (taken from the analysis of a synthetic mixture) is incorporated to show that the methods recommended will give results well within the limits of practical error:

Synthetic Explosive Mixture.

	c c.
Air (20.8 per cent. oxygen)	60.0
Nitrogen	22.1
Carbon monoxide	15 0
Hydrogen	2.3
Electrolytic gas HO	20.2
Total in explosion	110.6

Products of Combustion: Carbon dioxide, 14.90 c.c.; water, 23.45 c.c.

Calculated Composition of Synthetic Gas: Carbon monoxide, 14.9 c.c.; HO, 20.2 c.c.; H, 2.2 c.c.

The residue from the above was then mixed with H_2O and hydrogen, and again exploded, the amount of oxygen recovered in the products of both explosions being 12.37 c.c., whereas the theoretical amount in the synthetic mixture was 12.48 c.c. As the carbon monoxide is never completely removed by cuprous chloride the method recommended for gases, which do not contain hydrocarbons other than methane, is the estimation of carbon monoxide, methane and hydrogen by explosion. In the analysis of coal and illuminating gas the carbon monoxide is estimated by absorption and the hydrocarbons estimated as methane along with the hydrogen. The method of analysis may be more readily understood by an explanation of the data taken from a producer gas.

A volume of 100.0 c.c. of gas is accurately measured off in the burette, the reading being taken ½ minute after the gas begins to enter the burette. It is then passed through the caustic solution 4 or 5 times, when the reading is taken again, making the same allowance of time as above stated (this rule being observed throughout the entire process of analysis). The oxygen is then removed by the sodium pyrogallol solution and the volume remaining observed. It is 95.6 c.c., and is known as the residual. The communication between the burette and the explosion pipette is now opened and the gas allowed to slowly enter the latter until exactly 60 c.c. remains in the burette, having passed 35.6 c.c. into the explosion pipette. The remainder of the residual may now be reserved in the oxygen pipette or expelled from the apparatus. Exactly 70 c.c. of air is taken into the burette, and 15.0 c.c. of H_2O from the generator. This mixture of 85.0 c.c. is added to the residual in the explsion pipette, making the total explosion mixture of 120.6 c.c. The pipette is shaken slightly and allowed to stand ½ minute, to insure thorough diffusion, and exploded, the stopcock communicating with the receiving flask being left open. As soon as the contraction has taken place the products of combustion are returned to the burette and measured, the reading being 92.4 c.c. This gives a total contraction, due to condensation of water and combustion of oxygen, of 28.2 c.c., from which we deduct the volume of H_2O added, 15.0, the remainder being 13.2, or (c) the first contraction. The carbon dioxide is now removed by passing the gas through the caustic solution 5 times, the volume absorbed being 10.9 c.c., or (D) the second contraction. We now have a residue of 81.5 c.c. remaining, which consists of nitrogen and excess oxygen from the air used in the explosion, and nitrogen from the gas under examination. This residual is now passed slowly into the explosion pipette until exactly 50 c.c. remains in the burette. To the portion in the burette is added 20.0 c.c. of pure hydrogen from the hydrogen generating pipette, and 20.0 c.c. of H_2O. This mixture of 90.0 c.c. is added to the portion previously passed into the explosion pipette, and the total mixture of 121.5 c.c. exploded, as before explained. After explosion the gas is returned to the burette and the contraction, due to the total condensation, measured, which we find to be 35.5 c.c. Deducting from this the 20.0 c.c. of H_2O added to the explosive mixture we have 15.5 c.c., or (E) the third contraction, ⅓ of which represents the excess of oxygen remaining after the first explosion, or 5.15 c.c. This deducted from the total oxygen used, or (A) the number of c.c. in 70.0 c.c. of air, the remainder leaves 9.41 c.c., or (B) the oxygen consumed. The explosion ratio, or (R), is the relation of the residual after the oxygen determination, to the volume of the same taken for explosion. Having now all the necessary data at hand the percentage of methane, carbon monoxide and hydrogen may be calculated by the simple formula given below.

The time for complete analysis with the apparatus is about 15 minutes under ordinary circumstances in the hands of an experienced analyst.

Formula for Hydrogen, Methane and Carbon Monoxide.

A = oxygen used.
B = oxygen consumed.
C = first contraction.
D = second "
E = third "
X = hydrogen.
Y = carbon monoxide.
Z = methane.

A = air used by percentage oxygen in air.
B = A − 1/3 E, or 3B = 3A − E, or 3B = E − 3A.
B = ½Y + 2Z + ½X (1)
C = ½Y + 2Z + 1½X (2)
D = Y + Z (3)

X = C − B.
Y = D − Z.
Z = B − ½ (C + D.

On January 26th last, Mr. H. Allan Odell tendered his resignation as Vice-President of the South Shore Gas Company, of Babylon, N. Y. It is needless to say that it was accepted, which acceptance completely severed all business relations between the Company and himself.

[Continued from Page 71.]

PROCEEDINGS, SIXTH ANNUAL MEETING, AMERICAN GAS INSTITUTE.

Held in St. Louis, Mo., October 18 to 20, 1911.

First Day—Afternoon Session.—Part I.

The President announced that next in order was the consideration of the topic, "Production and Market for Ammonia Products," anent several contributions respecting which had been prepared. He would suggest that the papers be first read, to the end that joint discussion could ensue. He then introduced Mr. W. N. McIlravy, who read the following paper entitled

THE PRODUCTION AND MARKET FOR SULPHATE OF AMMONIA.

The United States now ranks third among the nations of the world producing, or perhaps, one may more properly say, recovering, ammonia from coal. England last year recovered 375,000, Germany, 373,000, and the United States, 105,000 metric tons, reckoning all forms of ammonia as sulphate. Although the output of this country is not as yet one-third of that made in England or Germany, its potential production is nearly as great as that of both these countries together. Therefore, a study of present conditions is of value at this time, as it may cast some light on the character of the development that it seems extremely probable the near future will bring.

About 74 per cent. of the estimated production of the United States for 1910 came from by-product coke ovens, and the prospects are that any considerable increase in the production of the country will come from this source. Some years ago it seemed that the use of coal gas was on the increase, and if that tendency had continued we might have looked forward to a recovery of ammonia from this source that would in time rival the figures reached in England, where nearly ½ of her immense annual output is from this source. As is well-known to gas men, however, the discovery of new supplies of petroleum west of the Mississippi river has had the effect of lowering the cost of carburetted water gas, the normal increase in the gas consumption in the country, being largely, if not entirely, covered by gas made in this way rather than by coal gas. So far as figures are obtainable there has not been any appreciable increase in the coal gas production of the country since 1907. The prospects and performances of the by-product coke oven, therefore, will bulk large in this paper. However, the dividing line between the by product coke oven and the coal gas industry proper is becoming less and less distinct, and the discussion of matters affecting so important a residual as ammonia is of vital interest to every gas man.

Sources of the World's Production.—The United States is not the only country in which the by-product coke oven plays the principal figure in ammonia production. In England, the greatest coal gas country in the world, the proportion of the sulphate of ammonia produced in coal gas works is but 47 per cent. of the total output, while the by-product coke oven produces 26 per cent., and has more than doubled in the last 5 years. England has other sources of ammonia production, the principal one being the blast furnaces in Scotland, where the use of a splint coal makes the recovery of ammonia from furnace gas possible, the shale oil industry, the recovery gas producers (Mond,, etc.), and the bone carbonizing industry. But out of a total increase of 28 per cent. in the last 5 years, the gas works have supplied 4 per cent., the other sources 6 per cent., while the coke ovens may claim 18 per cent. or over ¾ of the total 5 years' increase. England consumes but 87,000 tons of her annual production, exporting the rest to all quarters of the globe.

In Germany the by-product coke ovens play by far the greatest role. The production from this source is given as 84 per cent. of the total, the balance being principally due to the coal gas works. The feature of the German industry is the tremendous annual increase that has been regularly made. The output of 190,000 tons in 1905 was increased to 377,000 tons in 1910, or nearly double in 6 years. And here we may pause to note the fact that by efficient and far sighted propaganda the German market has been educated to consume the entire home production.

In the United States the total production for 1910 was about 116,000 net tons, of which the by-product coke ovens made 86,000 tons. The figures for the production of sulphate of ammonia and sulphate equivalent show that the output of the country, which was 17,000 tons in 1898, doubled itself by 1902, a space of 4 years, doubled itself again, by 1906, and while it has not doubled itself in 1910, the increment has been greater than for any other preceding 4 years. In the last period it should be noted there occurred a business depression in 1908, causing the first set back in the constantly advancing figures of production. The figures for the percentage of total output due to the coke ovens show also that the increase has been constant, except for the depression in 1907–8 already referred to. The coal carbonized in the coke ovens, as reported for 1910, amounts to 9,456,000 net tons, which indicates a recovery of 0.91 per cent. of sulphate of ammonia on an average. Considering that several of the plants are operated on low volatile coal, which yields but little ammonia, this figures speaks fairly well for prevailing standards of practice.

In France the sources of production include the shale works and sewage disposal, as well as gas works and by-product coke ovens. The by-product coke oven forms the largest single item, amounting to 47 per cent. of the whole, and the only one that seems to be increasing.

The production of the other countries of the world is small in relation to those already discussed, and, although some of them possess coal, and, therefore, are potential producers of ammonia, their industries are not yet developed to a degree that promises any considerable recovery in the near future. The details of the world's production are given in the table, in appendix. In examining this table it will be noted that to facilitate tabulation all long and net tons have been reduced to metric tons.

The aggregate output of the world is over 1,050,000 tons of sulphate of ammonia, representing 262,500 tons of nitrogen. The export of nitrate of soda from Chile, for the year 1910, is given as 2,251,000 tons, or about 349,000 tons of nitrogen. Therefore, of a total of 611,500 tons of combined nitrogen furnished, sulphate of ammonia supplies 43 per cent. As the corresponding figure for last year was 40 per cent., there has been a small gain for sulphate of ammonia. Since far more nitrate of soda is used for purposes outside of agriculture than of sulphate of ammonia, it is probable that, of the two, sulphate of ammonia actually supplies the most nitrogen for the use in fertilizers.

As regards the possible development of and of the minor English and French ammonia producing industries in the United States, it may be said the recovery from blast furnace gas is due to the use of splint coal, and does not seem at all likely to be introduced in this country. The distillation of shale, a source which the United Kingdom now derives 60,000 tons of sulphate equivalent per year, has not as yet been established in the United States, altho ugh it is stated that suitable shale exists in certain regions, and the in dustry may, therefore, obtain a foothold at some later date. The carbonization of bone is carried on in the country to some extent, and ammonia is produced by this process; but it is not increasing, and does not hold out any promise of doing so. The recovery of ammonia from gas producers, in which direction England has made some progress, has not made any advances of importance lately. In addition to these processes there is the possibility (we may even say the probability) that some one of the new methods of producing ammonia as such from the atmosphere may come into commercial importa nce, notably the process recently discovered by Prof. Haber; but it is too early as yet to hazard any definite predictions in this direction. A review of the situation, therefore, forces us to the conclusion that the by-product coke oven is at present the largest producer of ammonia, and promises to be the principal source of increase in ammonia production for the immediate future.

Relation of Present to Possible Ammonia Recovery.—Generally speaking, bituminous coal will yield 1 per cent. of its weight in sulphate of ammonia, if treated by dry distillation. Therefore, the possible ammonia production of the country would be about 1 per cent. of its consumption of bituminous coal. But the present methods of consuming coal are far from realizing any such ideal; nor does there seem likely to be any great change in the near future. It is, however, reasonable to reckon that every ton of coal actually subjected to dry distillation should be called upon to yield its quota of sulphate of ammonia. Such a calculation would show, within reasonable limits, the development that by-product recovery has reached in the countries considered, and indicate the possibility for extension. Fairly approximate figures of this kind are accessible for England, Germany and the United States.

In the United Kingdom the coa l treated in coke ovens of all kinds, and in coal gas works in 1908, amounted to 35,233,523 tons. The sulphate of ammonia that could have been produced, according to the average figures for modern practice, may be estimated at 1 per cent., or 352,335 tons. The amount actu ally produced from coal in this year, according to the official reports given further on, was 248,100 tons, or

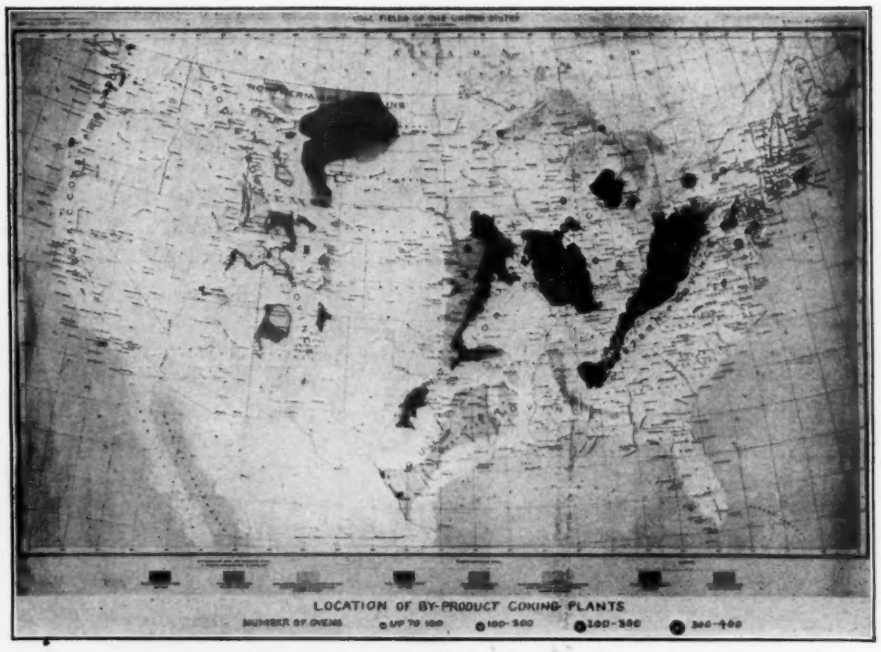


Fig. 1.—Map of Coal Fields of United States, Showing Location of By Product Coking Plants.

Fig. 2.—Map of Coal Fields of United States showing Location of By-product Coking Plants, Larger Scale.

70 per cent. of what might be designated as recoverable. In other words, the efficiency of England's ammonia recovery is 70 per cent.

Since 1908 the English production has increased to 369,000 tons of sulphate of ammonia in 1910, and, as most of the increase is in the amounts derived from coal, the efficiency figure is probably even higher than has been given. For 1906 the efficiency was 57 per cent., which shows a decided gain since then. The production of metallurgical coke in Germany in 1910 was 23,600,362 tons, which corresponds to a coal carbonization of about 33,700,000 tons. Using the same percentage figure as for England, this coal should theoretically have produced 337,000 tons of sulphate of ammonia. The actual production of the country was 373,000 tons. of which 60,000 tons may be reckoned as coming from the gas works, leaving 313,000 tons as the actual recovery from the coke works. This is 93 per cent. of the theoretical and indicates the general use of recovery appliances in the coking industry. This figure also shows that Germany has nearly reached the maximum production to be expected from the amount of coke now made. In the United States the latest official figures available are for 1909. The coal coked in by-product and beehive ovens was 59,354,937 net tons, and in addition there was about 3,600,000 tons used in coal gas making, or about 63,000,000 tons of coal in all. This should have yielded 630,000 net tons of sulphate of ammonia, or its equivalent. Actually but 106,500 tons were produced, or 17 per cent. In 1907 this figure was 15 per cent., so there has been a small gain.

If we compare these efficiency figures we are compelled to admit that England and Germany lead the United States, not only in the proportion of recoverable ammonia which they save, but also in the rate at which this figure is increasing. The United States cokes nearly as much coal as both countries put together, yet produces less than one-sixth as much ammonia. It cannot be stated that the quality of coal available in Germany or England is better suited to by-product recovery, nor are there other natural conditions that particularly favor these countries; it is merely a question of developing the industry. Looking at it in this way, it may seem that the United States has made but little progress in by-product recovery, but there is something to be said on both sides of the question. Important changes in so large an industry always require time, and in spite of the loss of valuable by-products that has gone on for years in the beehive coke plants, the business has, generally speaking, been profitable. There are over 100,000 beehive ovens in existence in the United States, representing an investment of many millions of dollars, a large part of which would be lost if the change were made.

The Probable Direction of By-product Coke Oven Development.—The by-product coke oven is, generally speaking, a tributary of the blast furnace. Although a considerable tonnage of coke is used in foundries and for domestic and industrial fuel purposes, by far the major part of the coke consumed in the United States goes to make pig iron. This seems likely to be the fact for some years to come, at least. The natural location for the coking plant, therefore, is between the coal mine and the iron works.

Most of the beehive coking plants are located at the coal mines for various reasons, among which no doubt is the fact that the wasted by-products make so much smoke and annoyance that they would not be tolerated except in the thinly populated coal regions. In the case of the by-product plant, however, it has been found that the process can be carried on in or near large cities, and that this location offers a better chance to dispose of the residuals, particularly the gas. Thus it has come about that the recovery plants are being generally located near the blast furnaces rather than near the coal mines. Other reasons, as the ease of shipping coal rather than coke, favorable freights and the desirability of mixing several kinds of coal, tend in the same direction. The latest large steel works, as those at Buffalo, Joliet and Gary, are incorporating the by-product ovens with the steel plant. These facts have an important effect in determining the geography of sulphate of ammonia production. Also, because of the great area of the United States, they strongly influence its distribution.

Although the supply of coking coal in the United States is very large, the coal fields are confined to certain districts. Their location may be seen by glancing at the map (Figs. 1 and 2), on which the existing by-product coking plants are also shown.

Three important coal fields and all of the by-product coking plants lie to the east of the Mississippi river. The largest and by far the most important field is known as the Appalachian Region. It begins in Western Pennsylvania and Eastern Ohio, extends in a southwesterly direction across West Virginia and Kentucky, decreases in width as it crosses Tennessee, and comes to an end in Alabama. It is with this field that we are principally concerned, as much of it, more particularly the eastern portion, is of satisfactory coking quality. The coal produced in the Northern Region, lying wholly in Michigan, is not of coking quality, and of the extensive coal beds in the Eastern Region, lying in Illinois and the western portion of Indiana and Kentucky, only a limited area in the southern part produces merchantable coke.

There is some coking coal in the southern part of the western region, lying in the State of Oklahoma, and there is also some in the mountain and in the San Juan regions in Colorado and New Mexico, but

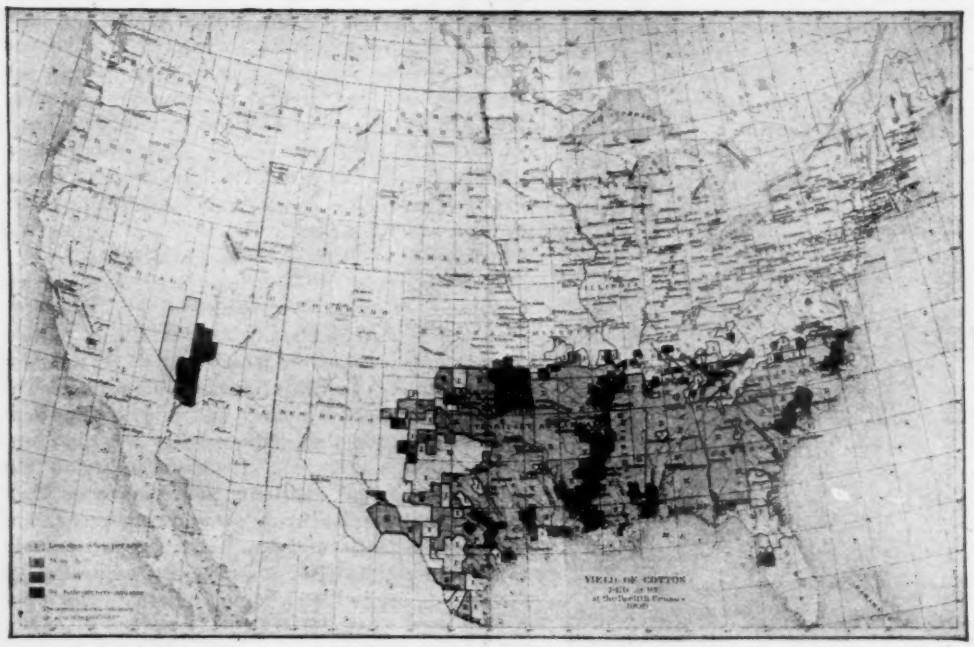


Fig. 3.—Yield of Cotton in United States.

there does not appear to be any immediate prospect of by-product ovens being erected there. The same statement is true of the coking coal field lying near Seattle, in the State of Washington.

We return, therefore, to the consideration of the Appalachian Region. Nearly all the existing recovery plants obtain their coal from its mines, and it is probable that most of the plants built in the near future will do the same. The operating plants arrange themselves naturally in a northern group of 25 establishments and a southern group of 3 establishments. It is noticeable that few of the existing plants in the northern group lie within the coal region, and that some are at a considerable distance from it. As a matter of fact, the first plants built to make blast furnace coke were in the Pittsburgh district, adjacent to the blast furnaces there. Later plants were built to take care of the furnaces lying to the east at Baltimore, Lebanon, Harrisburg and Chester, and at Boston and at Camden for gas production. Nevertheless the tendency of the steel industry is not now in this direction, but rather towards the west, because of the supplies of iron ore available on the great lakes. The result of this tendency has been the building of the large plants at Buffalo, Detroit, Joliet, Gary, Milwaukee, Duluth and Sault Ste Marie, the latter just over the Canadian line. Therefore, reasoning from what has been done, and considering the direction in which new construction is being planned, it seems certain that the center of by-product coke production, and, therefore, of sulphate of ammonia recovery as well, will be in the vicinity of Chicago. As we have not only to consider the production of sulphate of ammonia, but also its profitable disposal, these facts are of prime importance to us. Unfortunately the probable center of sulphate of ammonia production is not at all where market conditions are at present most favorable. Sulphate of ammonia being a by product cannot have its point of production chosen with particular reference to the facilities for disposing of it.

Market for Sulphate of Ammonia.—It should be stated, in the first place, that any increase of our present production of ammonia must be marketed as sulphate. The consumption of ammonia, in the form of concentrated liquor and similar forms, is always taken care of first, as these forms do not require outlay for acid on the one hand and are more difficult of shipment on the other, which tends to reduce foreign competition. Although a certain amount of sulphate of ammonia is used in chemical manufacture, it is relatively small, the principal use of this article being in agriculture as a carrier of nitrogen; therefore, we may regard the fertilizer market as the only one to be considered in discussing the future prospects of the sulphate of ammonia disposal. Consequently, the States in which the consumption of artificial fertilizers is the largest are those in which the market for sulphate of ammonia is to be found. Generally speaking the need of fertilizers in the United States is very great, although the consumption is impressive, being estimated for the year 1910 at nearly 6,000,000 tons, valued at $118,000,000. The area of improved farm land, according to the census of 1910, amounted to 477,448,000 acres. Therefore, the American farmer applied a little less than 25 pounds of commercial fertilizer per acre to his land that year, costing about 25 cents. This is a very low figure and indicates a possibility of considerable extension. It should be considered, however, that a great deal of stable manure is also used as a fertilizer, and besides that, in some of larger agricultural States, almost no fertilizer at all is used, which tends to increase the average of other States.

Unfortunately, the largest fertilizer consuming districts do not lie anywhere near the center of sulphate ef ammonia productions. This may be readily seen by inspecting the table of the fertilizer consumption of the various States for the past year. [See pp. 93, 94.] The 4 States at the head of the list, Georgia, North and South Carolina and Alabama account for over 3 million tons, and the adjacent States of Florida, Mississippi and Louisiana consume nearly ½ million tons more. This is 58 per cent. of the total estimated consumption of the United States; the amount expended by the consumer for these fertilizers was over $60,000,000. Yet the only accessible sources of domestic sulphate of ammonia supply in these 7 States, which have an area greater than the German Empire and Austria together, are by-product coking plants near Birmingham, Ala., at the lower end of the Appalachian coal region. Unfortunately, the coal gas industry of these States holds out little help. According to "Brown's Directory" the total coal carbonized in the 36 plants that make coal gas at all in these 7 States would only yield 1,400 tons of sulphate of ammonia if it were all saved. As many of the plants are small, a great deal of this is not recovered at all.

The by-product oven plants at Chicago are about 700 miles away, and the freight makes such shipments practically out of the question, when we consider the low cost at which the producers of England and Germany can place sulphate of ammonia at the Atlantic and Gulf ports. This is one of the important difficulties that lie in the way of developing the market for our future sulphate of ammonia production, and which render the adoption of well considered propaganda methods essential to success.

The value of the crops produced in these States is enormous. Together with Eastern Texas, Arkansas, Tennessee and Indian Territory, they produce practically all of the cotton crop, valued at $900,000,000 this year. This is the most valuable of any crop produced in the United States, except corn, and of this crop the Secretary of Agriculture credits the Southern States with one-third, or a value of $500,000,000 for last year.

In addition to this the South is responsible for over $300,000,000 worth of wheat, tobacco, hay, oats, sugar and rice, besides other cereals, fruits and vegetables. A large portion of the land on which these crops are raised is most responsive to proper fertilization, and particularly to a supply of nitrogen. In many districts no farmer expects to raise a crop unless fertilizer is used. This is especially true of the cotton crop, yet there is much room for improvement, in that the average yield per acre for the last 4 years has been barely over one-third bale, whereas, 3 times as much is easily within reach if proper means are used. The map showing the yield per acre graphically represented by shaded areas, indicates this clearly (see Fig. 3). The darkest areas indicate the districts of highest yield, the lighter color showing a crop of under ½ bale per acre. Yet there is an acre of poor land near Athens, Ga., which has been fertilized with sulphate of ammonia and which will yield between 2 and 3 bales of cotton this year.

Much of the needed fertility has been supplied in the past by cotton seed and cotton seed meal. This valuable fertilizer, formerly burned in heaps as waste, is now fully appreciated, but a new and wide field has been found for it as a stock food, in this country, for which purpose it has long been used abroad. Its price has risen so much that it can no longer be freely used as a fertilizer, and as its higher value seems likely to be permanent, a substitute must be found. This need sulphate of ammonia is admirably calculated to fill. Its use as a top dressing on cotton has been very successful and has received unqualified endorsement from agricultural authorities. What a general adoption of sulphate of ammonia in the mixed fertilizers that are used at the present stage of progress would mean may be approximated by.

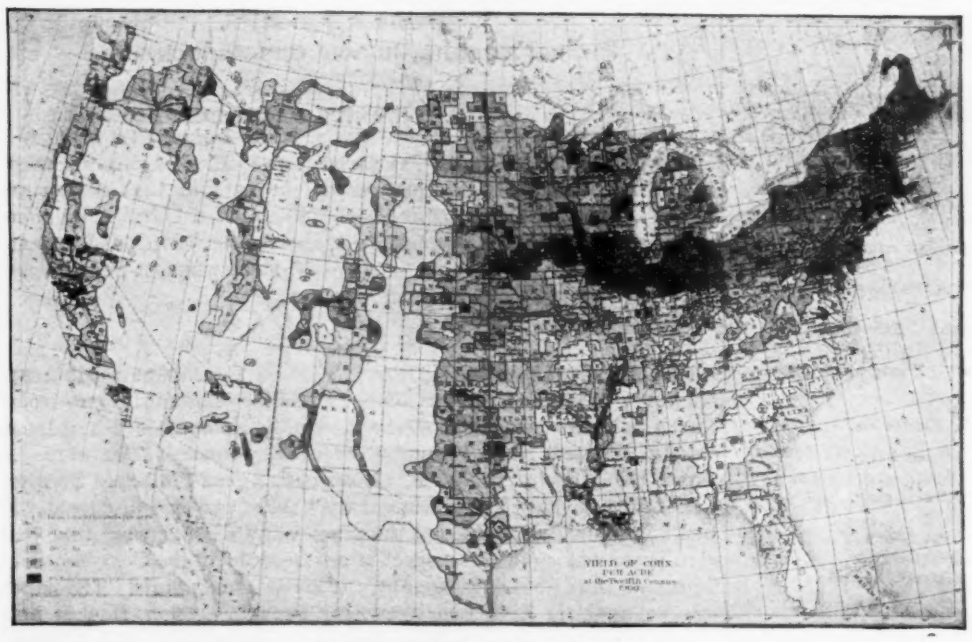


Fig. 4. Yield of Corn in United States.

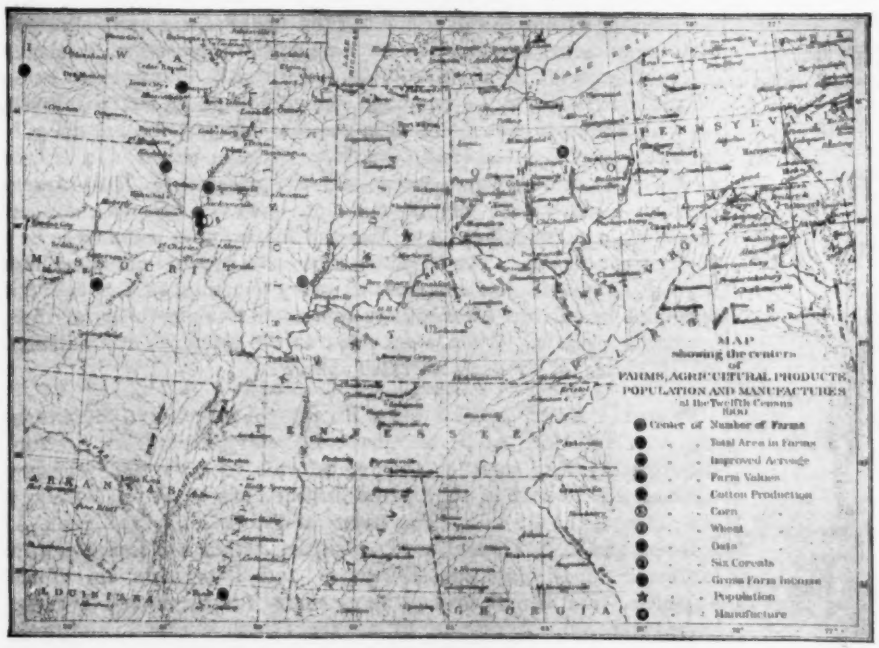


Fig. 5.—Centers of Population, Etc.

supposing that the 3½ million tons of commercial fertilizer now annually used in the 7 States already referred to were of the familiar low grade 2-8-2 formula: Two per cent. nitrogen, 8 per cent. phosphoric acid, 2 per cent. potash, and contained, therefore, 200 pounds of sulphate of ammonia to the ton. This alone would require 350,000 tons of sulphate of ammonia, without allowing for the probable increase in fertilizer consumption. We have so far been discussing the very favorable conditions for fertilizer development in the States which the larger American producers of sulphate of ammonia practically cannot reach. Let us see what are the conditions that prevail in the States near Chicago, the assumed geographical center of sulphate of ammonia production. We can hardly do this better than by looking at the diagram (Fig. 4), which shows the yield of corn per acre in the United States. The densely shaded portions correspond to a yield of 40 bushels per acre, and over, while the lighter tinted areas denote 30, 20, 10 and less than 10 bushels per acre. The area of no corn production is left white.

As corn is a very widely distributed crop, and forms part of most farm rotations in practically all sections, the diagram also indicates fairly well the farming areas of the United States. Considering only the eastern, fully shaded portion, we find that the section of the highest yield is clearly the strip beginning in Ohio, crossing Indiana and Illinois, and ending in Iowa. This is the celebrated corn belt, being noted for rich farms and prosperous farmers; but the soil is the prairie sod, of great depth and stormed with humus and nitrogen by centuries of undisturbed growth. In spite of the years of cultivation that it has had it still yields generous crops with little or no fertilizer. It is stated, by the agronomists of the Illinois Experiment Station, that, in the course of repeated experiments with nitrogenous fertilizers for field crops on the soils of the State, they cannot find that an increase in yield is obtained sufficient to pay for the fertilizer. This statement applied to nitrogen alone, however. Applications of phosphoric acid, particularly as ground, undissolved rock, seem to yield excellent results. The fact seems that the soil is still possessed of sufficient nitrogenous matter to withstand the demands made upon it. Of course, this resource cannot always remain intact, if continually drawn upon, but the present system of agriculture carried on seems to succeed without a nitrogenous fertilizer.

This is indicated by the figure for fertilizer consumption in Illinois, 32,000 tons for 1910, as given in the table. Much of this consumption is ground phosphate rock, untreated. Some complete fertilizer is used in market garden crops, but then again the local conditions are unfavorable, as the large stock yards in Chicago and East St. Louis sell a great deal of manure at a low price to the gardeners within railroad hauling distance. Unfortunately, this is directly in the center of sulphate of ammonia production.

In Indiana and in Ohio, conditions are much more favorable. The fertilizer consumption of both these States is fairly large; 175,000 for Ohio and 150,000 for Indiana; and, particularly in Ohio, the need of fertilizers is being strongly felt. The soil, formerly having the same resources of plant food as possessed by the present Illinois land, has finally become depleted, and must be restored. It may be noted here that this region still enjoys a supply of natural gas, which seriously diminishes the use of coal gas and the consequent recovery of ammonia.

The States lying east of Ohio are in the same general condition. Short-sighted agricultural methods have robbed the soil and fertilizers are needed to restore it. The agriculture grows more intensive as we come east, and the quantities of fertilizers used per acre are larger, although the smaller area in improved farm lands cuts down the actual total. In Michigan and Ohio the sugar beet industry has taken hold, and this promises to be a favorable outlet for sulphate of ammonia. The value of the sugar output last year was $10,000,000 for this district. But little fertilizer is used as yet in beet cultivation, but the need is becoming apparent, and will surely increase. Especial attention is being given to the development of this outlet for sulphate of ammonia. If we consider the farming lands lying west and northwest from Chicago, we find conditions very different from those in the East. The States of Wisconsin, Minnesota, Iowa, Missouri, the Dakotas, Nebraska and Kansas, produce 57 per cent. of the wheat, 48 per cent. of the oats, 37 per cent. of the corn, and 31 per cent. of the hay, grown in the United States, comprising ⅓ of the total improved farm area of the whole country.

Yet their present use of fertilizers is practically nothing. Aside from Missouri, which is about on a par with Illinois, the total for the other 7 States is hardly over 11,000 tons. Their tremendous crop totals are raised by virtue of the stored up fertility of the soil alone.

The great importance of this northwestern region, as far as agricultural products go, may be seen by glancing at the map showing the centers of number of farms, area, cotton and cereal production, etc. (see Fig. 5). According to this diagram all the centers given lie a little west and south of Chicago, with the exception of cotton production, which we have already seen lies in Mississippi, and the center of manufacturing, which lies near the middle of Ohio.

Although the Dakotas, Nebraska and Kansas are about as far from Chicago as the Southern States already discussed, they are still fur-

(*Continued on page* 92.)

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NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, FEBRUARY 5, 1912.

[Official Notice.]

Forty-second Meeting, New England Association of Gas Engineers.

New England Association of Gas Engineers,
Office of the Secretary,
East Boston, Mass., Jan. 31, 1912.

The Forty-second Annual Meeting of the New England Association of Gas Engineers will be held Wednesday and Thursday, February 14th and 15th, 1912, at Young's Hotel, Boston, Mass.

The following papers have been prepared:

"Shavings Scrubbers," by Dr. J. F. Wing, Everett, Mass.

"The Office as a Publicity Medium," by Palmer York, Fitchburg, Mass.

"Recent Developments in the Manufacture of Water Gas," by Viggo E. Bird, Fall River, Mass.

"Industrial Appliances," by H. L. Barnes, Hartford, Conn.

"High Pressure Distribution," by C. G. Goeltz, Weymouth, Mass.

Question Box.

"What is the amount of condensation (in gallons) that is considered allowable per 1,000,000 feet of gas pumped into high pressure distribution lines at 5 pounds, 10 pounds or 20 pounds pressure?"

"What would be considered the fair allowable loss, in feet per 1,000,000, or percentage of loss on account of the condensed matter that is pumped or run off from the high pressure lines?" Answers edited by C. E. Page, Malden, Mass.

"The Pitot Tube: To what extent do gas companies use same to determine the actual flow of gas in mains?"

"Proper temperature of the carburetor and superheater for proper gasification of the enricher in water gas plants; and what experience members have had in using pyrometers to obtain this temperature."

"Riveted steel, main pipe, placed between condensers and rotary outlet; and, again, forming the main inlet line in the purifier house, having been in use 3 years, suddenly develop signs of pin holes, which, later on, grow to such an extent as to necessitate a change to cast iron pipe. The wasting away of the steel metal occurs from the inside toward the outer surface. Has any one experienced similar troubles with steel pipes, and was the cause with remedy found for same?"

Applications for membership should reach the Secretary by Tuesday, February 13th, in order to be acted on at the meeting. Members will dine together at Young's Hotel, 6:30 P.M., Wednesday, Feb. 14.

All friends of the Association are invited to attend the meeting.

N. W. Gifford, Secretary.

[Official Notice.]

Annual Meeting, Illinois Gas Association.

Illinois Gas Association,
Temporary Office of Secretary,
Dixon, Ills., January 17, 1912.

To the Members, Illinois Gas Association: The next annual meeting of the Illinois Gas Association will be held in the Auditorium Hotel, Chicago, under dates of March 20th and 21st, 1912. Announcements as to papers to be discussed will shortly appear in this Journal.

F. E. Newberry, Secretary.

BRIEFLY TOLD.

New Jersey, Company Section, National Commercial Gas Association.—A meeting of the Company Section, National Commercial Gas Association, was held in the Assembly Room, Board and Bank streets, Newark, N. J., Thursday evening, January 25th, 1912. A paper, prepared by Mr. W. R. Causbrook, Agent Plainfield District, on "Office Display and Maintenance" was read and discussed. It was unanimously agreed that the paper was one of the best that had been presented so far in respect of the records of the Company Section, and the discussion brought out many good points. The paper was particularly discussed by Messrs. French, Marion, Hacker and Thomas, of the Newark New Business Department. Mr. Halsey, Chief Clerk of the Newark office, also gave his views regarding office maintenance from the standpoint of the bookkeepers and collectors. This paper seems to strike the keynote of the importance of having your offices neat in appearance and faultlessly clean, these being potent auxiliaries to the complete showing of goods well displayed, all with a view to making the best possible impression upon the public. The next meeting of the Company Section, which is to be held in March, will be given over entirely to amusement. The different kinds of talent within the organization have volunteered their services for their respective specialties and the evening bids fair to be a very enjoyable one. The Directors also have in mind plans for having one or two similar numbers at every meeting, in the belief it will tend to enliven the meetings and avoid the possibility of their becoming prosaic. We are indebted to the attention of Chairman W. H. Pettes for the facts narrated above.

February Meeting, New York Section, Illuminating Engineering Society.—Mr. A. J. Marshall, Secretary, New York Section, Illuminating Engineering Society, informs us that the February meeting will be held in the United Engineering Societies' Building, at 8:15 P.M., the 8th inst. The paper of the evening (by Messrs. A. J. Sweet and L. C. Doane) has for its title, "Choice of Reflector: Its Influence on Illumination Efficiency and Depression in Visual Function," and it will present many useful results proved from extended research. A number of members (both executive and rank-and-file) will dine informally at Keen's Chop House, 36th street, near 6th avenue, between 6 and 6:30, just prior to the meeting. All are invited.

President Stacey Corrects a Statement in the Abbott Paper.—Mr. James E. Stacey, President, The Stacey Manufacturing Company, writing under date of Jan. 31st, from Cincinnati, says that in an article written by Mr. Hunley Abbott, under the heading, "Gas Holder Foundations in Soft Soils," in Journal dated Jan. 29 last, the following appears: The handbook, "American Gas Engineering Practice," by M. Nisbet Latta, says: "The Stacey Manufacturing Company cites a recent instance of a holder (about 1½ million cubic feet capacity) erected upon soft ground, at a cost for wooden piling of 75 cents per square foot over the whole area of the same. These piles were capped with 2 feet of concrete, but the foundations failed immediately upon the filling of the holder tank with water." In connection with this Mr. Stacey denies that his Company ever designed either a foundation or a tank that failed; furthermore, the Company never erected a tank upon a foundation built or designed by any of its customers, that failed. The designing of a foundation for a tank, to meet any condition, is a very simple problem. Failure is due to disregard of plans and specifications by unscrupulous subcontractors and inefficient supervision.

CURRENT MENTION—

Mr. John Hugh Cassidy, Vice-President of the well-known gas fixture manufacturing concern, which has for years been operated in New York city under the title of Cassidy & Son, died at his home, 17 Hillyer street, Orange, N. J., the morning of the 30th ult. He was

very prominent in the Masonic circles of New Jersey. He was in his 34th year.

MR. MALCOLM M. GRAHAM, Secretary of the New York and East River Gas Company, has been elected to the vacancy on the Board of Directors occasioned by the death of that estimable gentleman, Mr. Frederick P. Addicks.

THE only thing which kept Mr. Joshua M. Gould, of Troy, N. Y., from utter poverty was his deposit with the Gas Company. His sworn statement shows liabilities of $4,142, and assets of $5, in the custody of the local Gas Company, as an assurance that he would pay for the gas consumed in his household.

AT the annual meeting of the Grand Rapids (Mich.) Gas Light Company the officers elected were: Directors, Henry Sullivan, L. H. Withey, A. P. Lathrop, Emerson McMillin, J. B. Pantlind, W. H. Anderson, V. F. Dewey, Henry Idema and L. J. Rindge; President, Emerson McMillin; Vice-President, A. P. Lathrop; General Manager, V. F. Dewey; Treasurer, Jas. A. Hulswit; Secretary, Glenn R. Chamberlain.

WORK on the new holder, to be constructed at the junction of Fort avenue, Leadenhall, Race and Randall streets, South Baltimore, Md., for the Consolidated Gas, Electric Light and Power Company, of Baltimore, by the Bartlett-Hayward Company, is underway. The vessel, which is to rest in a steel tank, will have a diameter of 219 feet, is to have 5-lifts, and is rated to retain 6 millions cubic feet. The The Baltimore *Evening Sun*, in its mention of this leviathan, says that the Bartlett Hayward folks recently constructed a holder in New York, that is "slightly larger" than the new Baltimore example. "Slightly" in this case hardly seems the proper word, in that the firm named has constructed in Greater New York, 2 holders in which the Baltimore latest example could be easily stored. The first of these (on the Astoria plant of the Consolidated Gas Company) is up to retaining 15,110,000 cubic feet; the second example is the magnificent holder erected in the Maspeth-Newtown district of the Brooklyn Union Gas Company, which easily takes care of a top load amounting to 10,000,000 cubic feet. These holders are within 4 miles of each other.

MR. GEORGE M. LEMON, of Jackson, Mich., has been appointed Assistant Chief Engineer of the Youngstown (O.) Consolidated Gas and Electric Company, and assumed charge of his duties the 1st inst. His predecessor was Mr. E. H. Bell, who, the 1st prox., resigned to take up the task of directing the engineering work of the well-known firm of Philadelphia electrical engineers, Messrs. Day & Zimmerman. Good luck to them.

AT the organization meeting of the Standard Gas Company, incorporated under the laws of New Jersey, as of date the 23d ult., to operate gas plants in the Sea Isle section of that State, will have its temporary headquarters in Camden, N. J. The following executive organization has been perfected: President, Lawrence J. Downey; Treasurer, Jas. J. Hagan; Secretary, Jas. A. McGuigan. It is capitalized in $30,000.

THE City Council, of Phœnix, Ariz., has entered into a contract with the proprietors of the Pacific Gas and Electric Company, under which the latter is to perform the public lighting of the named place for a period of 5 years, from January 1st. The agreed upon rate is 5 cents per kilowatt hour, and the service includes the ordinary open arc lamps and the ornamental street lighting standards as well.

MR. WILLIAM WALLEN, the clever, wideawake Manager of the Oshkosh (Wis.) Gas Light Company, has been elected Third Vice-President of the Wisconsin Electrical Association.

THE Danville (Ills.) Gas, Electric Light, Steam Heat and Street Railway Company will not accept the ordinance recently adopted by the City Council, under which it was directed to establish and put in effect a gas rate not to exceed $1.10 gross, or $1 net, per 1,000. Superintendent Johnson, in response to queries respecting the Company's attitude in the premises, said: "The Company will unquestionably decline to accept the ordinance. Further, it should be borne in mind that the city cannot enforce it. Except the city of Chicago, which is governed by a special charter, the laws of Illinois give cities no control over gas and electric rates. The ordinance if not accepted by our Company amounts to nothing, it is worthless. The subject of gas and electric rates is very complex and requires exhaustive study and investigation. One cannot off-hand arrange a set of rates. Conditions affecting rates vary widely in different communities and from various causes. There is every indication that when the State Legislature convenes again next fall there will be introduced a bill providing for a State Commission to control rates of various public utilities. Such a Commission would have authority, facilities and knowledge to make an intelligent investigation and establish rates that would be fair to both the public service concerns and to the public. Our Company is perfectly willing to leave the matter open for a Commission to handle."

"B." SENDS the following from Philadelphia, Pa., under date of Tuesday last: "The financial statement of the United Gas Improvement Company for the quarter ended December 31, 1911, showed that the Company owed the city for that quarter the sum of $342,001, under the terms of the royalty agreement by which it operates the Philadelphia gas works. Such obligation represents payment to the city of 10 cents per 1,000 cubic feet on 145,810 cubic feet of gas sold prior to 1908, and 15 cents per 1,000 cubic feet on 2,280,514,610 cubic feet sold in October, November and December, 1911. In the last 3 years the quantities of gas sent out per annum in Philadelphia were:

Years.	Quantities.
1909	7,996,337,270
1910	8,543,733,870
1911	8,798,531,130

IT is said that New York capitalists recently visited Bath, N. Y., to inspect the property of the Bath Electric Light and Gas Company, with a view to purchasing the same. They also visited the neighboring settlements of Avoca, Savona and Kanona for the purpose of determining whether the inauguration in these of an all-day electric service on power and lighting accounts from the Bath plant would pay. It is likely the property (which is now controlled by Philadelphia capitalists) will change hands as a result of this inspection.

HEALTH SUPERINTENDENT FORD, of Cleveland, O., is outspoken in his championing of the framing of a city regulation positively forbidding the placing of gas stoves minus flue connections. Assistant City Solicitor Stevens, when asked for an opinion respecting the validity of such an ordinance, said such regulation was clearly within the province of the Board, and that it could be enforced.

MESSRS. D. WEAVER, R. S. Bicksler, E. W. Meyer and J. B. Weaver, of North Lebanon township, and Henry Weaver, of Mount Joy, have been informed that their application for a charter from the Governor of Pennsylvania, under which they propose to operate the North Lebanon Gas and Fuel Company, of Lebanon, has been sanctioned.

ON the 7th inst. Messrs. Josiah E. Scott, Parker Borden, Jno. A. Riggins and Augustus Mellier, will apply to the Governor of Pennsylvania for permission to incorporate the New Hope Gas Company, the character and object of which are to manufacture and supply gas for light, heat and fuel to the residents of New Hope and the township of Salebury, Bucks county.

"E. C.," writing from Providence, R. I., under date of the 29th ult., incloses this: "A Philadelphia miss of 6 years had contracted the habit of mispronouncing words terminating in 'ing.' Not long ago she informed her mother she had been 'playin' with so-and-so. Whereupon mama said: 'You must say playing, dearie; do be more careful about using the letters 'ing.' Shortly afterwards her brother (slightly her senior) commenced to tell her about two boys with whom he had been 'fighten.' Whereupon the miss exclaimed, 'Oh! my brother, don't talk like that. Be more careful and use your U. G. I.'s.' Is it necessary to ask by whom was her papa employed?"

WE welcome to our desk the initial issue of "Gas Institute News," Vol. I. No. 1 of which made its first trip through the mails, bearing date of February 1st. It looks good from the viewpoint of the printer, and, not in any sense to disparage President Copley, whose "lineaments," show only all the better to display those of Secretary Ramsdell, we must say that the latter's announcement fully tells the story of the line of thought that led to the founding of "Gas Institute News," and to equally well expound the policy that will govern the publication looking to its development and expansion. "Gas Institute News" will for the present be printed each month.

RECENT changes in the Gilbert & Barker Mfg. Company, of Springfield, Mass., are the retirement of John F. Barker from the Presidency of the concern, and the retirement of Vice-President W. C. Clarke, as well. They were succeeded, respectively, by Mr. R. C. McNall, of New York, and Mr. Chas. C. Ramsell, of Springfield. The latter has been Treasurer of the corporation for some time; and he will continue to so serve, as will Mr. W. T. Raynor, the present Asst. Treasurer.

(*Continued from p.* 89.)

ther from the sea coast, and will ultimately draw on the Chicago field for additional nitrogen. The indications are that the nearer States, Wisconsin, Minnesota, Iowa and Missouri, will need nitrogen first.

We cannot expect the natural fertility of the northwestern States to continue indefinitely. In fact, they already show signs of diminished reserves, in that the yield per acre of some crops is stationary, or is dropping slightly, instead of constantly gaining, as should be the result of economic farming on new ground. The actual yield of wheat per acre is 13.7 bushels, of oats 28 bushels, of barley 24 bushels, while the averages of England are 32 bushels of wheat, 42 bushels of oats and 34 bushels of barley. The yields for these States average but little higher than those for the whole United States, in spite of the rich soil and suitable crops. They may be said to represent extensive and depleting rather than intensive and enriching agriculture. The need for fertilizers when it does come, will find the production of sulphate of ammonia close at hand.

In the meanwhile, it has been necessary for our propaganda to overcome the handicap that the disposal of sulphate of ammonia has been laboring under because of the distance of the most advantageous market and the relative lack of nearby consumption. Owing to the general use of ready mixed fertilizers by the American farmer, and to the long campaign of education necessary to bring him to buy and mix the single ingredients for himself, no special effort has yet been made to promote the retail demand. The advantages of using sulphate of ammonia have been persistently called to the attention of the manufacturers of mixed fertilizers, and the entire domestic production has been disposed of to them. No difficulty whatever has been experienced by them in its use, and, in fact, it is rapidly coming to be preferred as a carrier of nitrogen. The field experiment work that has been done with the farmers has helped in this, as it has made them favorably disposed towards sulphate of ammonia and caused them to specify it in the mixtures they call for.

It should be remembered in this connection, one of the strongest competitors that sulphate of ammonia has to encounter in the Northern and Middle Western Districts is the large quantity of so called animal "ammoniates" produced in the meat packing plants. The constant advertising they have received, and the resulting experience in their use, have made the farmers in the districts in question favorably disposed toward them, and the use of this form of nitrogen in the mixed fertilizer is frequently preferred. The amount of these "ammoniates" is not actually known, but it has been stated as equivalent to 70,000 tons of ammonia or 240,000 tons of sulphate of ammonia. It should be remembered that the supply of nitrogen in this form has practically been taken up by the market in advance of the introduction of sulphate of ammonia in any large amount. The use of nitrate of soda, of which 544,559 tons were imported in 1910, also has to be reckoned with, although it should be noted in this connection that at least ¼ of this nitrate of soda was used for acid manufacture, explosives, and different uses other than as a fertilizer. While nitrate of soda is unquestionably an efficient form of nitrogen, its use in mixed fertilizers presents certain difficulties, because of its deliquescent character, which causes the mixture to cake, and be cause of the chemical action that takes place between it and acid phosphate.

U. S. Imports Nitrate of Soda, 1905.

	Net Tons.	Per Cent.
Fertilizers	42,213	= 13
Dyes and chemicals	38,309	= 12
Glass	11,915	= 4
Explosives	134,034	= 41
Acid manutacturing	29,301	= 9
Unaccounted-for	67,937	= 21
Total import	322,709	

Much propaganda work has been done with the manufacturers in the way of calling their attention to these well-known facts and suggesting the remedy, the result being entirely satisfactory to them, as is shown by the increased demand and the attendant rise in price.

Consumption and Average Price of Ammonia in the United States.—The consumption of sulphate of ammonia and sulphate equivalent in the United States ranks next to that of Germany. The figures of imports and consumption are given in the table. (See pp. 93, 84). The salient point that appears in the import figures is the increase that has taken since 1909, the amounts having jumped from 40,192 tons to 63,178 tons, an advance of over 50 per cent. Moreover, this advance is not merely temporary. The import figures are for the fiscal year ended June 30th; but if we take the calendar year ended December 31st, 1910, we find that the imports actually amounted to 83,000 tons, or double the figure for the year preceding. For the fiscal year ended June 30, 1911, the imports were 103,251 net tons, or 20,000 tons in excess of the calendar year and 68 per cent. more than the last fiscal year. In all probability the consumption of 1911 will approach 225,000 tons.

In examining the average price figures given in the table it should be borne in mind that, in August, 1909, the existing rate of duty of $6 per ton on sulphate of ammonia was removed and the article placed on the free list. This accounts for the drop in price for the year 1909, and also in part for the low price figure in 1910. A fairer idea of the actual movement of prices is given by the table of weekly quotations for the past 2 years, from which it is evident that the fall in prices, due to the removal of the duty, has been gradually regained, in that the present price is practically at the same level as it was before the duty was removed. From this we may infer that the law of supply and demand, reinforced by effective propaganda methods, can be made to supply the place of a protective tariff.

Propaganda for Sulphate of Ammonia.—The need of a comprehensive propaganda for sulphate of ammonia has been apparent to those closely in touch with conditions, for a long time. The other materials that are used in making fertilizers, as potash salts, nitrate of soda, superphosphates, basic slag, etc., have found a propaganda essential. Germany, for example, is the home of the potash monopoly, and this essential element of a complete fertilizer can only be obtained there in any quantity, yet they have carried on a propaganda for 20 years, and their organization is probably the strongest and most complete of any, covering not only Germany, but nearly all foreign countries. It is regarded by them as the basis of their commercial success.

In the same way an energetic propaganda is being carried on in the agricultural countries of the world for nitrate of soda, the great competitor of sulphate of ammonia. If such methods are necessary for articles like potash and nitrate, the output of which can be raised or lowered, within reasonable limits, with reference to the varying demand, how much more it is needed for a product like sulphate of ammonia, which is a by-product, and made entirely with reference to the demand for coke and gas, rather than to its own market prospects?

The Germans were the first to undertake this work for sulphate of ammonia, and they have covered the country so well that the home consumption amounted to 350,000 tons in 1910, and in 1911 will probably exceed the home production, in spite of its rapid increase. This has been done by effective advertising, publishing bulletins, giving lectures; but, before all, by actual field tests, made on plots chosen on the farmer's own fields, where all can see and note the results. Hundreds, even thousands, of such tests are made every year. The material so obtained is used as the basis of bulletins and pamphlets.

An organization, comprising a central office and 22 branch offices, in charge of trained agriculturists, is maintained in Germany alone. Each office has its assigned territory which it covers through a number of co-operative agents, who make addresses, carry on experiments and give information; but no sales are made. The wholesale trade is supplied from the central office, the retail from the local dealers.

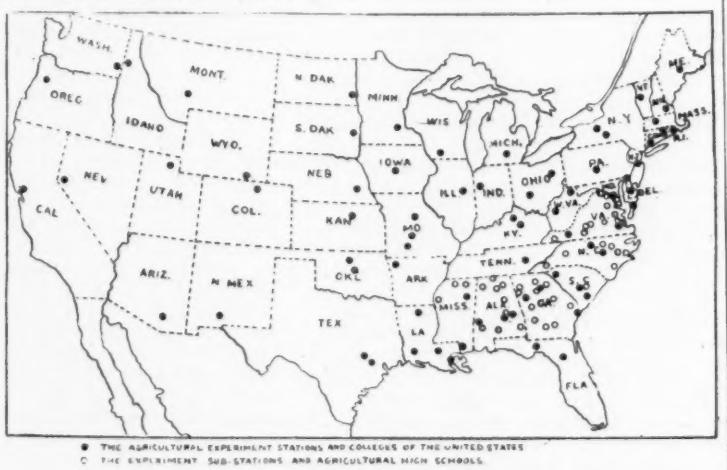
The results that have been obtained in this way have led to the beginning of similar work in France, Belgium, Holland, Denmark, England, and in our own country. England, the worlds' largest producer, was especially in need of such measures, since four-fifths of her output has to be placed on the export market, instead of going on her own farms, where much of it could be profitably used. England's propaganda has now been underway 2 years, and results are already apparent.

In the United States propaganda work has been carried on for a number of years past, on a gradually increasing scale. At first the work was done only with the manufacturers as the immediate consumers, to which we have already referred; but, 5 years ago, the necessity of work that would appeal to the ultimate consumer, the farmer, was apparent. It should be borne in mind in this connection that really valuable agricultural data of this character cannot be obtained in one or two seasons, therefore, an early start was most advisable.

As the conditions did not favor a direct appeal to the farmer, the work was taken up with the State Agricultural Experiment Stations. There is at least one of these in each State and Territory in the Union, and in some there are two or three, the total number being 63. In addition to this there is an agricultural college in each State, in some

cases located at the experiment station, in others elsewhere. The experiment stations frequently have several outlying demonstration farms or sub-stations under their control, and in some States, notably Virginia, Alabama and Georgia, there is a complete system of secondary agricultural schools tributary to the agricultural college.

In addition to these two organizations the U. S. Government maintains an extensive research department known as the "Bureau of Plant Industry." The bureau conducts tests and investigations along certain lines, frequently co-operating with the experiment stations. The distribution of the experiment stations is shown on the diagram, which also shows the agricultural colleges where they are separate from the stations and the secondary agricultural schools, also the sub-stations. (See Fig. 6.)



● THE AGRICULTURAL EXPERIMENT STATIONS AND COLLEGES OF THE UNITED STATES
○ THE EXPERIMENT SUB-STATIONS AND AGRICULTURAL HIGH SCHOOLS

Fig. 6. Location of Agricultural Experiment Stations, etc.

Working through the directors of the various stations east of the Mississippi, and some of those west of it, as far as Colorado and Wyoming, by means of personal visits, lectures, and correspondence, we have elicited the support of most of them in our propaganda. Many of them have included sulphate of ammonia in their scheme of experiments, and we regularly supply them with sufficient for their purposes. As a result of this work bulletins have been published giving the results of successful tests and advocating its use; where formerly no mention was made of it, sulphate of ammonia is now receiving its share of attention.

The same line of approach has been followed with the separate agricultural colleges, many of which have found a place for experiments with sulphate of ammonia as a part of their farm demonstration work. The secondary agricultural schools have been enlisted in the same manner, by suggesting experiments and donating the fertilizers, in some cases standing part of the further expense involved. This work is particularly important, as it reaches the boys and young men who do not go to college, but go back to the farm. Through the experiment stations and colleges we also reach the farmers' institutes, corn clubs, etc. In South Carolina 20 boys are carrying out a practical farming experiment with sulphate of ammonia, under direction of the experiment station authorities, who supervise the work and report it to us. Through the co-operation of the Bureau of Plant Industry we have been able to have sulphate of ammonia included in an extensive series of tobacco, corn, grass rotation experiments carried on in the States of Maryland, North Carolina, South Carolina and Virginia, under expert supervision, to continue for several years. The results of this work cannot but be most valuable to us. Already the showing made by sulphate of ammonia has been most favorable.

The matter of farm demonstrations has been taken up on a much more extensive scale this year. Two agencies have been established, in charge of trained agriculturists, one in Athens, Ga., the other in Cleveland, O. The men in charge devote their entire attention to obtaining experiments with the farmers in their territory, and co-operate with the State experiment stations and agricultural schools wherever sulphate of ammonia can be introduced. These representatives do not attempt to sell, either to farmers or to manufacturers. Particular stress is laid, however, on the kind of tests they undertake, as it is relatively easy to put out a large number of experiments, but not so easy to obtain any results of value for advertising purposes from them. As no immediate sales are expected from our experiments until the retail trade shall be taken up, their value is largely for propaganda literature later on.

Before all, it is essential that work of this character should be carried out with a high standard, and that advice as to the use of sulphate of ammonia should be such as will enlist the indorsement of recognized agricultural experts. Only in this way can a substantial and enduring reputation be built up; and if we look beyond the immediate commercial ends that such a propaganda must necessarily serve, we will see it is really an active educational force on the one hand, and an aid in promoting the conservation of our natural resources on the other. It helps to transform a noxious waste into soil fertility and beneficient growth. It is a movement that the gas and coke industries have reason to be proud of.

APPENDIX.

Ammonium Sulphate and Sulphate Equivalent Produced in the United Kingdom.[1]

	1903.	1904.	1905.	1906.
Gas works	149,849	150,957	155,957	157,160
Iron "	10,119	19,568	20,376	21,284
Shale "	37,353	42,486	46,344	48,534
Coke ovens	17,438	20,848	30,732	43,677
Producer gas and carbonizing works	10,265	12,880	15,705	18,736
Total	233,664	245,990	269,114	289,391
	1907.	1908.	1909.	1910.
Gas works	165,474	165,218	164,276	168,000
Iron "	21,024	18,131	20,228	21,000
Shale "	51,338	53,628	57,048	50,000
Coke ovens	53,272	64,227	82,886	120,000
Producer gas and carbonizing works	21,873	24,024	24,705	120,000
Total	313,281[1]	325,228	349,143	369,000

1. Long Tons.

These figures are from the Alkali Inspector's reports, except for 1910, which are estimates given out by Messrs. Bradbury & Hirsch.

Production of Ammonium Sulphate and Sulphate Equivalent from By-product Coke Ovens and Gas Works in Germany.[1]

	1902.	1903.	1904.	1905.
Coke ovens	117,000	120,000	152,000	168,000
Gas works	18,000	20,000	21,000	22,000
Total (metric tons)	135,000	140,000	173,000	190,000
	1906.	1907.	1908.	1909.	1910.
Coke ovens		257,000		270,000	313,000
Gas works		30,000[1]		60,000	60,000
Total	235,000[2]	287,000[2]	313,000[2]	330,000[2]	[2]373,000

1. Dr. N. Caro, *Zeit. f. angew. Chem.*, Sept. 14, 1906.
2. *Deutsche Amwoniak-Verkaufs-Vereinigung*, 1906-'07-'08-'09-'10.

Ammonium Sulphate and Sulphate Equivalent Producer in France.

	1907.	1909.	1910.
Gas works, Paris and vicinity	14,000	14,000	17,000
Provincial gas works	4,000	4,000	
By-product coke ovens	21,700	22,800	26,500
Sewage disposal	11,500	11,300	11,500
Shale works	900	900	1,000
Various sources	500	500	
Total (metric tons)	52,600	53,600	56,000

World's Sulphate of Ammonia Production.

	1903.	1904.	1905.	1906.
England	237,520	250,050	273,550	294,170
Germany	140,000	173,000	190,000	235,000
United States	38,000	49,600	59,250	68,000
France[2]	42,000	43,000	47,300	49,100
Belgium and Holland[3]	35,000	[3]39,000	24,200	30,000
Spain[3]	....	....	10,000	10,000
Italy[2]	45,000	48,000	4,500	5,000
Other countries[2]	....	....	40,500	40,000
Total (metric tons)	537,520	602,650	649,300	731,270
	1907.	1908.	1909.	1910.
England	318,400	330,450	354,747	374,925
Germany	287,000	313,000	330,000	373,000
United States	90,120	79,500	96,600	105,143
France[2]	52,700	52,600	53,600	56,000
Belgium and Holland[3]	[3]55,000	[4]35,000	[4]40,000	[4]43,000
Spain[3]	[3]12,000	....	12,000	9,000
Italy[2]	11,000	[4]80,000	12,000	12,000
Other countries[2]	65,000	....	[4]73,000	[4]79,000
Total (metric tons)	891,200	890,550	97,947	1,052,068

1. Including Norway, Sweden and Denmark.
2. Estimates from l'Engra's.
3. Including Portugal.
4. Estimates from *Deutsche Amwoniak-Verkaufs Vereinigung*, 1908-'09-'10.

United States Ammonia Consumption, Expressed in Sulphate Equivalent.[1]

	1900.	1901.	1902.	1903.	1904.
Imports	8,411	14,486	18,146	16,777	16,667
Total consumption	36,011[2]	13,765	54,270	58,650	71,331
Average price	$57.40	$55.16	$59.90	$62.10	$61.71
	1905.	1906.	1907.	1908.	1909.	1910.
Imports	15,288	9,182	32,669	34,224	40,192	63,178
Total consumption	80,584	84,187	132,000	121,874	149,192	179,178
Average price	$62.92	$62.93	$61.93	$59.90	$56.04	$55.60

1. The figures for consumption and price are for the calendar year, while those for imports are for the fiscal year ending June 30th.
2. Short tons.

U. S. Ammonia Production Expressed in Sulphate Equivalent.[1]

	1898.	899.	1900
By-product coke ovens	3,600	6,000	13,800
Coal gas and bone carbonizing works	13,400	[2]13,400	[2]13,800
Total	17,000	19,500	27,600
Per cent. coke ovens	21	31	50
	901.	1902	1903.	1904.
By-product coke ovens	15,279	18,483	24,098	32,653
Coal gas and bone carbonizing works	[2]14,000	[2]17,641	17,775	22,011
Total	29,279	36,121	41,873	54,664
Per cent. from coke ovens	52	5	57	60
	1905.	1906.	1907.
By-product coke ovens	41,864	....	62,700
Coal gas and bone carbonizing works	23,432	....	36,609
Total	55,296	[2]75,000	99 309
Per cent. from coke ovens	64	....	62
	1908.	1909.	1910.
By-product coke ovens	50,073	75,000	86,000
Coal gas and bone carbonizing works	33,327	[2]31,500	[2]30,000
Total	83,400	106,500	116,000
Per cent. from coke ovens	60	70	74

1. Short tons. 2. Estimated.

The figures for coke oven production are from actual reports by operating plants or from "Mineral Resources." Those for coal gas production are from "Mineral Resources," where obtainable, with allowance made for boneblack production.

Commercial Fertilizer Consnmption of United States.

State.	Quantity.	Value.
Georgia	1,022,048	$16,819,000
South Carolina	975,039	15,130,000
North Carolina	630,905	12,245,000
Alabama*	425,000	7,627,000
New York	375,000	9,375,000
Virginia	344,951	6,925,000
Pennsylvania*	300,000	6,756,000
Maryland	225,000	3,375,000
Ohio*	175,000	4,163,000
Florida	172,641	3,601,000
Indiana	151,856	3,695,492
Mississippi	132,776	2,699,000
Maine*	125,000	4,063,000
New Jersey	125,000	4,206,000
Arizona*	200	6,000
Arkansas*	25,000	596,000
California	36,660	2,132,000
Colorada*	2,000	58,000
Connecticut*	62,500	*1,875,000
Delaware*	23,000	*575,000
Idaho*	700	21,000
Illinois	32,000	571,000
Iowa*	3,500	107,000
Kansas*	2,400	73,000
Kentucky	58,000	1,348,000
Louisiana	88,396	2,001,000
Massachusetts*	65,000	1,931,000
Michigan	40,000	936,000
Minnesota*	2,100	63,000
Missouri	31,585	662,000
Montana	200	10,000
Nebraska	.....	.....
Nevada	160	8,000
New Hampshire*	50,000	510,000
New Mexico	480	24,000
North Dakota*	300	9,000
Oklahoma	8,000	26,000
Oregon	310	13,000
Rhode Island	10,300	309,000
South Dakota*	350	11,000
Tennessee	58,612	1,212,000
Texas	34,000	589,000
Utah*	380	19,000
Vermont	22,000	570,000
Washington*	2,000	79,000
West Virginia	32,500	520,000
Wisconsin	2,500	122,000
Wyoming*	100	5,000
	5,875,449	$117,770,492

The States using over 100,000 tons per year are arranged in order of their consumption, the remainder being arranged alphabetically. The values given are from the census reports and the quantities are from data supplied by the State agricultural authorities, except those marked * which are estimated.

The balance of the appendix is given to a tabular statement respecting weekly quotations per 100 pounds domestic sulphate ammonia, 25 per cent., as taken from the New York "Oil, Paint and Drug Reporter." These show as follows: Average price, first 6 months of 1909, 2.904; last 6 months, 2.6995; average for year, 2.802. For 1910, the figures were: Average first 6 months, 2.07; for last 6 months, 2.86; for year, 2.78. For 1911, first 6 months, 3.066.

(To be Continued.)

PROCEEDINGS, FOURTH ANNUAL MEETING, INDIANA GAS ASSOCIATION.

HELD IN THE CLAYPOOL HOTEL, INDIANAPOLIS, IND., JANUARY 17 AND 18, 1912.

FIRST DAY—MORNING SESSION.

The President (Mr. S. E. Mulholland, Fort Wayne, Ind.), in calling the meeting to order, said: Gentlemen, it is my pleasure and privilege to call to order, the fourth annual meeting of the Association. It is a most agreeable surprise this morning to find the attendance so large, not only of our active but of our associate members as well, remembering that the weather conditions for the past 2 weeks have been extremely trying on the gas business as well as on the railroads. I know the average gas man feels that it is a hardship, and that he is almost unwarranted in leaving his business at such a time, but as the weather has moderated considerably during the past 24 hours, I think we can all rest reasonably easy and feel that things are going safely at home. This morning the executive committee reported it unwise to make a change in the time of the meeting; but this matter will be brought up for the action of the Association later on. Although our meeting is called for 10 A.M., it is now 10:30, but the delay is due to our awaiting the presence of Gov. Marshall, who, on his way over from the State House was detained. Inasmuch as we do not know exactly how soon he will put in an appearance, we will go ahead in the transacting of some routine business with the understanding that we will stop everything upon the Governor's arrival, to listen to his address of welcome. The first order is the roll call and election of new members. The former is usually dispensed with, inasmuch as the registration is taken at the door. As to the election of new members, having found from past experience that a considerable number of applicants come in during the meeting, making it necessary to again open up the question, it would be well to defer action on such election until later in the session. Next come the minutes of the last meeting. A motion to dispense with the reading of same will be entertained. [Motion made by Mr. Graf, seconded by Mr. Kaufman to such effect was moved, put and adopted.] This brings us to the

REPORT OF THE EXECUTIVE COMMITTEE,

which the Secretary will please read.

The usual meetings of the Board of Directors have been held during the year 1911-12. During the year there has been nothing extraordinary in the gas business to call for special report. The Committee realizes, however, that the welfare of the gas companies of the State should be maintained by a loyal and earnest co-operation of every one of their officials. It is urged that as many of the company officials as possible be enrolled members of this Association, for the consideration and protection of gas interests, and for the mutual strengthening of those ties that bind all gas men together everywhere.

Much care has been exercised in the selection of the topics for the papers to be presented at the annual meeting, and the Association is especially fortunate in having for the present convention, Dr. S. W. Parr, Professor of Applied Chemistry, University of Illinois, who will present a valuable paper on "Calorimetry," and give a short talk on "Surface Combustion."

The Committee also feels that every member of the Association should make a special effort to be present at the Association's annual meetings. In order to make the meetings additionally enjoyable, as well as profitable, it has been decided that it might be advisable to have an informal dinner and a theater party, to get the views of the individual members of the Association in this matter. The responses show that, with very few unavoidable exceptions, the members are in favor of this new departure.

The President, Secretary and members of the Committee have endeavored to secure as many additional members as possible for this meeting, and the large increase in membership is one of the gratifying items of the report which will be presented at this meeting.

The Executive Committee desires to recommend the following amendments to the Constitution and By-laws, namely: Sec. 4, par. 15, to strike out the words: "The affairs of the Association shall be managed by the Executive Committee, subject to the control of the Association by its action in general meetings. It shall be composed of the President, Vice-President, Secretary-Treasurer and 6 Directors, the majority of whom shall constitute a quorum." And that the following words be substituted:

"The affairs of the Association shall be managed by the Executive Committee, subject to the control of the Association by its action in general meetings. The Executive Committee shall be composed of the officers and Directors of the Association, the majority of whom shall constitute a quorum."

That Sec. 5, par. 17, which reads: "The officers shall consist of a President, Vice-President, Secretary-Treasurer and 6 directors. The President, Vice-President and Secretary-Treasurer shall be elected annually by ballot and assume office on the first day of the month next following their election. Two directors shall be elected annually by a ballot to serve 3 years, and shall assume office on the first of the month following their election," shall be stricken out, and the following words substituted:

"The officers shall consist of a President, Vice-President, Secretary-Treasurer and 9 Directors. The President, Vice President and Secretary-Treasurer shall be elected annually by ballot, and assume office on the first day of the month next following their election. Three Directors shall be elected annually by ballot to serve 3 years, and

shall assume office on the first day of the month following their election."

The by-laws provide that all proposed amendments or additions to the constitution shall be presented by the Executive Committee in the regular report to the Association, during the first session of any regular meeting, and the voting upon their adoption shall be made the first order of busines for the second session of the meeting. This by-law, therefore, gives power to our Association to make these desirable changes in our constitution at the present annual meeting.

The Executive Committee also recommends that Sec. 6, Par. 21, which reads, "The annual meeting of the Association shall be held on the third Wednesday of January of each year," shall be changed to read, "The time of the annual meetings of the Association shall be left to the decision of the Executive Committee of the Association."

S. E. MULHOLLAND, President;
HOWARD L. OLDS, Vice-President;
CARL H. GRAF (*Ex-Officio*);
JAMES W. DUNBAR,
S. T. MURDOCK,
O. O. THWING,
D. A. BARNES,
J. N. MONCRIEFF,
A. S. COOKE,
} Directors.

PHILMER EVES, Secretary-Treasurer.

The President—Gentlemen, the report of your Executive Committee is before you. What is your pleasure?

A Member—Does the third week in March conflict with the Illinois meeting?

The President—The matter was looked up in the GAS JOURNAL to ascertain the times of meeting of the other Associations occurring, and our Secretary found nothing in the way of a meeting of any of the Associations in March.

Mr. Parker—The Illinois meeting occurs March 15th and 16th. A good many associate and some of the active members attend both meetings.

The President—Would the fourth Wednesday in March be better?

Mr. Parker—Yes.

The President—With the consent of the other members of the Executive Committee present, we will set the date of our next convention for the fourth Wednesday of March instead of the third. In explanation of the report as read, while it sounds very formidable in a certain way in regard to amendments to the constitution and by-laws, all it means is increasing the Board of Directors from 6 to 9. A motion would be in order for the adoption of the report of the Executive Committee, and the question then would go over until our next meeting before taking a vote. [On motion of Mr. Cooke, the amendment proposed by the Executive Committee was concurred in.]

GOVERNOR MARSHALL WELCOMES THE ASSOCIATION.

The President—Gentlemen, it is my pleasure and privilege to present to you this morning a gentleman who needs no introduction; in fact, one who is better known to most of you than even your President. I am honored in presenting Governor Marshall. [Great applause.]

The Governor's response was as follows:

Mr. President and Gentlemen: It seems to be the strange fate of life that a man is always called to talk upon subjects about which he knows nothing. For many years I was an old bachelor, and I never attended a dinner that I was not called upon to respond to the sentiment, "Our wives; God bless them." [Applause and laughter.] And then I was married—with my full consent. I never have been blessed with any children, and until I put a kibosh on it, at all the dinners I was called upon to respond to the sentiment, "Our Children; the Dear Ones at Home." [Laughter.] I think it may be safely said that ordinarily public speaking is in inverse ratio to the amount of information a man has upon the subject. I am, however, glad to appear this morning, not only personally but officially, to welcome to the city of Indianapolis the representatives of the various gas companies of the State. An auspicious time for you to meet in the Capitol City is 1912, when the campaign is about to begin in the United States of America, and there will be need of all the gas and all the gas men who can be congregated in any one spot. I hold nobody responsible for the sentiments which I am about to utter except myself, and if I do not like the responsibility I can run away from it. I am one of those who believe in the largest liberty of individual opinion, and I know of no other way in which we can reach right conclusions in a representative form of government except by the frank and open discussion of all public questions. I do not believe they are to be settled with brickbats and clubs. I never was able to convince any man in my life that I was right and he was wrong by attempting to use any force in the nature of an argument. Upon the contrary, I think a great many of the vexed problems of life have been settled by men approaching each other in the spirit of concord and good will, realizing that there is hardly any public question which can be presented for determination upon which there may not be many things said upon all sides of the question. I recognize the fact that the gas plants of Indiana, under the laws of this State, when they have obtained the franchises of a city or town, have a vested right in those franchises, and they constitute a contract between the public-at-large and the owners of the plant, and that what I am about to say this morning can in no wise affect any of the rights which you now possess, and that they cannot be changed nor altered nor set aside without your voluntary consent. But I want to express the view, which I have reached after some deliberate consideration of the question, that while I am unalterably opposed to trusts and combinations in restraint of trade, I believe there are certain natural monopolies which must exist and which ought to be under governmental control. I mean by that, that nobody has any right to form a trust in clothing, because the trust might insist that, upon an occasion like this, I should wear a "Prince Willie" coat, and I object to the "Prince William" with the utmost strenuosity of my nature. There are a thousand things in the varied life of the people in which it is absolutely necessary that they should have unrestricted competition, not only for the purpose of buying as cheaply as they can, but also for the purpose of satisfying themselves with reference to the things which they do buy. But there are many things which are needed by mankind in common. Every man in the city of Indianapolis, except the politicians, needs gas [laughter], and he must have gas. Consequently, it seems to me that good business policy, both for the man who invests his money in a plant and the man who buys, would suggest—without taking sides between the two gas companies of the city of Indianapolis—appropriately that if we could have one gas company or one telephone company or one electric light company in the city of Indianapolis, so regulated and controlled by law as to give us good service at a fair rate and at the same time return an ample compensation to the amount of money invested in it, that it would be a distinct advantage, not only to the people who buy gas, but to the gentlemen who manufacture gas. [Great applause.]

If that is to be accomplished it must be accomplished by a franchise indeterminate in its character. In other words, that you can hold your franchise as long as you "tote square," and when you quit "toting square" you lose your franchise. You would be unwise, in my judgment, if ever in Indiana you attempt to do the things which have been permitted to be done by the Supreme Court of the United States with reference to the gas product of the State of New York. Whenever you attempt to capitalize and make the people pay interest upon a thing which they have given to you, you are going to hear a roar in Indiana that will be louder than the escape of any natural gas that ever came out of the dephts of the earth. You have no right, from my standpoint in public affairs, to capitalize your franchise. Upon the contrary, no public authority, if you were willing to come in under a public utilities commission, no public authority would have any right to fix the valuation of your property exclusively upon your mains and your machinery and your appliances and your fixtures, the physical things that you own. That it is not a fair valuation of your plant to determine how much money you should be entitled to a reasonable income upon. Many of your plants have been extremely unprofitable in their character. You have lost money year after year in bringing them up to their present condition, and if there should be a public utilities commission in Indiana, and you gentlemen should choose to yield up the charters and franchises which you now have and come under the control of the State, the State would be doing you a distinct injustice, unless it saw that you were actually made whole upon your investment for all the time you had engaged in the manufacture of gas. [Great applause.] Now gentlemen, I do not care to pursue this question, which certainly is a live and vital one. The manufacturer of nothing on earth myself except natural gas, and that so largely charged with wind that it has not a very large market price, you will permit me to say that I present these questions to you as good citizens of Indiana, for the determination of the two great questions which must always be settled and settled aright, or they never will be settled in America, the two great problems of "What shall I do for myself and my own best interests," and "What shall I do, as a citizen of Indiana, looking toward a square deal toward the people of the community whom I serve."

These are the things for your consideration. They will never be settled aright if the State attempts to settle them in the interests of the general public regardless of your interests, neither will they ever be settled aright if you attempt to settle them exclusively in your own interests and regardless of the interests of the public. I have an abiding faith in the patriotism of the average "Hoosier." He doesn't agree with me more than 3 times out of 10, but I think the heart of the "Hoosier" keeps beat with the higher sentiments of mankind. That, more-and-more, the "Hoosier" enlarges his horizon; that, more-and-more, he sees he is a part of a vast world movement which is making for the higher ideals of life, which is teaching the fatherhood of God and the brotherhood of mankind. It may seem strange that, in a hard-headed business meeting, speaking to hard-headed business men, of whom and to whom in the days gone by it had been said that "business is business and business is not sentiment," I should avow those statements. I think that, more-and-more, business is not only being business, but business is also being sentiment; and that, more-and-more, the ideals of the business men of Indiana are that they are serving themselves best when they are becoming a part and parcel of the commonweal of the people of Indiana. Gentlemen, I thank you. [Great applause.]

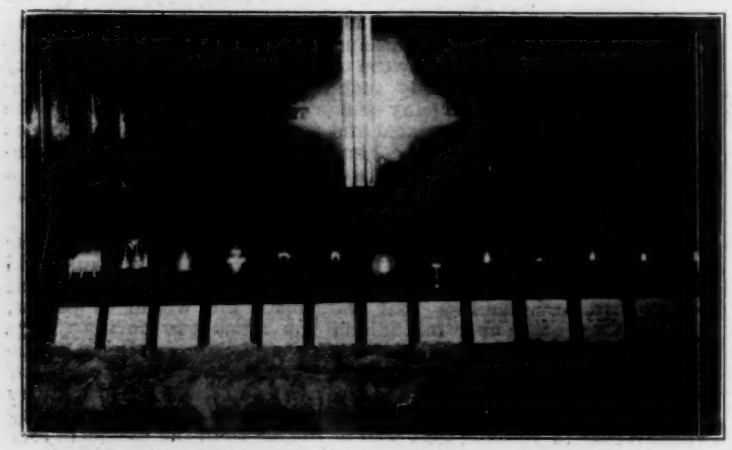
At the suggestion of the President, a rising vote of thanks was passed to the Governor for his welcoming speech.

(To be Continued.)

THE gas rate at Denver, Col., has been reduced to 85 cents per 1,000 cubic feet. Some years ago the gas rate in Denver was $1.35 per 1,000.

Management & Commercial Methods.

AN ATTRACTIVE SHOW WINDOW DEMONSTRATION.—The illustration nicely shows a demonstration that has been carried on in one of the windows of the main offices of the Tri-City Railway and Light Companies, at Davenport, Ia. It was arranged shortly before the Christmas season of last year, and it has caused quite some comment from travelling men concerned with placing gas company supplies, to say nothing respecting the attention it has received from the residents of Davenport. The picture shows a unique arrangement of compartments, all finished in dull black, each compartment being lighted by means of different illumination agents, the cost of the operation of each system being plainly printed on a tablet which is suspended from (and underneath) each illumination source. The close interest taken



in this display by the residents of Davenport has brought about the placing of large numbers of mantle lamps in that city. During the time that the window display was at its most attractive period the Company also carried on an active campaign for house piping, and in all the advertisements carried by the Company in the local news papers the window demonstration was repeatedly referred to.

It may be noted from the photograph that the wording on the office windows is counter to the wording on the views. That course, though, was necessary, from the fact that, in order to get a good photograph of the outfit, the picture had to be taken from the inside. Thus it became necessary to turn the exhibit around in the window, the lettering on the latter being accordingly reversed. We are indebted to Gen. Supt. Blackwell for the facts in this narrative.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,013,224. Gas Stove. F. Sattler, Belleville, Ills.

1,013,318. Gas Stove. F. Sattler, Belleville, Ills.

1,013,404. Process of Recovering Ammonia from Gases. H. Koppers, Essen, Germany.

1,013,581. Gas Water Heater. W. B. Bastian, Chicago, Ills., assignor to W. B. Bastian Mfg. Company, Pierre, S. D.

1,013,643. Safety Device for Gasholders. A. R. Cruse, Philadelphia, Pa.

1,013,790. Gas Range. M. W. Longfellow, Baltimore, Md., assignor to the Baltimore Gas Appliance Manufacturing Company, same place.

1,014,111. Gas Burner. J. B. Anderson, Shaler township, Allegheny county, Pa., assignor of one-fourth to W. G. Boyle, one-fourth to J. Gehring, and one-fourth to K. Fuerstenberg, Allegheny county, Pa.

1,014,241. Indicating Gas Analyzer. C. O. Mailloux and H. J. Westover, New York City.

1,014,385. Gas Producer. C. M. Garland, Collingswood, N. J., assignor to Camden Iron Works, Camden, N. J.

1,014,421. Gas Stove. A. and A. W. Streit, Cincinnati, O.

1,014,461. Electric Gas Lighter. H. D. Grinnell, Pittsfield, Mass.

1,014,522. Gas Producer. C. Roradeck, Newark, N. J.

1,014,654. Apparatus for the Manufacture of Gas. W. G. Laird, New York City, assignor to the Improved Equipment Company, same place.

1,014,715. Automatic Water Feed Acetylene Generator. I. Mumma, Dayton, O.

1,014,777. Gas Burner. E. S. Sanderson, Waterbury, Conn., assignor, by mesne assignments, to Welsbach Light Company.

1,015,232. Gas Burner Tip. P. Keller and P. Seiler, Chicage, Ills., assignors, by direct and mesne assignments, to H. Sander, same place.

Items of Interest
FROM VARIOUS LOCALITIES.

"B. V.," writing from Trenton, N. J., under date of the 27th ult., forwards the following: "This synopsis of a memorandum, filed 2 days ago, by the Public Utility Commissioners of New Jersey, as a result of their investigations into the propriety of charging by electric lighting companies for minimum or readiness to serve account, will likely interest your readers. The memorandum notes that these matters were alleged in the complaints:

"1. That a minimum charge is unnecessary and unreasonable, and should not be made.

"2. That, if imposed at all, it should be made by the year and not by the day.

"3. That it should not be made when the service is not needed, as when a house is closed temporarily in the summer months. The third point at issue applies to service furnished at seashore or other summer resorts where dwellings are closed from 6 to 8 months in the year.

"The Board's opinion reviews the development of public utilities, and quotes liberally prior decisions in those respects as made by corresponding bodies in other States. The Board declares that the making and collection of a minimum charge are warranted as to monthly periods, in fact are closer to the law than if the charges were made yearly; that a charge of $1 per month per installation is just and reasonable, but that a charge of $1 per meter is excessive where more than 1 meter is installed; but that a minimum charge of 50 cents per meter per month may not be considered excessive or unreasonable for each additional meter installed on one premises for the same customer supplied through the same service. Where a customer requests that service be discontinued for a period of at least 1 month or more the charge should be waived during such period. Where a consumer requires service for a limited period only, a reasonable charge may be made for the work of connecting and disconnecting the service at the beginning and end of the short period. Rules and regulations concerning service and all information in respect to rates and rate schedules should be available to the present or to prospective consumers. The minimum is held to *be a part of the rate schedule*, and should be incorporated with such schedule wherever it is put out to the attention of the public.

"Another accompanying memorandum filed by the Board deals with minimum charge for electric power. In this matter the Board announces that it does not regard a minimum charge of 50 cents per horse power per month as excessive or unreasonable, and further declares that a minimum charge for electric power service of $1 per month is neither excessive nor unreasonable. The Board, however, notes that the foregoing determinations relate to general practice, and that these are liable to amendment or modification in special cases, where suitable reason is shown that the modification asked for is proper."

THE Gas Machinery Company, of Cleveland, O., has been awarded a contract for the placing of a 24-inch ammonia concentrator, equipped with mechanical lime mixing and injecting apparatus, for the recovery of the volatile and fixed ammonia produced in the works of the Bangor (Me.) Gas Light Company. Mr. C. R. Stull, who it will be remembered was for some time in charge of the East St. Louis (Ills.) gas plant, but who has had charge of the Bangor establishment for quite a while, evidently means that nothing shall go to waste in his bailiwick.

THE Winchester Repeating Arms Company, of New Haven, Conn., has been granted permission to construct a brick and concrete building, 45 feet by 31 feet, and 2 stories in height, to house additional apparatus for the production of fuel gas to be used in its tempering, annealing and finishing rooms. Its present fuel gas plant has been in operation a length of time sufficient to determine its mechanical and economic value.

THE gas rate at Ludington, Mich., has been reduced to $1.25 per 1,000 cubic feet, a concession of 25 cents per 1,000, the new figure becoming effective the first of last month. It was, so-to-speak, an automatic decline, the charter or franchise of the corporation directing that when the annual output had reached 10 millions cubic feet, the rates should go to $1.25. The agreed-upon figure was reached about mid-January.

"M.," IN a newsy letter from Macon, Ga., under recent date, says: "I was in Americus, Ga., not long ago and had the pleasure of inspect-

ing Mr. Hagerty's new electric light plant, the finishing touches thereon or thereto having been made last week. It is a beauty. I refer to it as 'Mr. Hagerty's plant,' because he was and is responsible for the layout. And as it is in every sense a well laid out example of up-to date construction, I am sure Mr. Hagerty's superiors are well aware of the fact that he is a good sort of man to have on the job. * * * I have run across, in several places in the South, a notice recently issued by an oil company, which seems to be furnishing most of the oil to gas plants in this section, of a material advance in the price of oil. This is going to, or should have, the effect of calling the gas man's attention more forcibly to his coal gas installation, or cause him to give closer attention to the matter of the advisability of constructing one. * * * I note quite a degree of enthusiasm amongst the gas men of the South relative to the meeting of that body in Jacksonville, Fla., next month. The committee to secure new members is actively at work, and blank applications for membership can be found on the desk of every gas manager and superintendent in the South. President Hoyt and his associate executives are certainly making themselves liable to receive much congratulation over the pronounced success of the meeting, if current indications are to be the basis of a prediction."

At the annual meeting of the Portland (Me.) Gas Light Company the Directors elected were: Wm. H. Moulton, Fred. N. Dow, Elias Thomas, Herbert Payson, W. W. Thomas and Henry T. Sculley. The Directors subsequently perfected the following organization: President, F. N. Dow; Vice-President, Wm. H. Moulton; Engineer and Superintendent, E. H. Yorke; Treasurer, Burton Smart.

"Mayor Moulton, of Haverhill, Mass., is of that nondescript political faith, the telling for which is usually the word 'reform.' When he was pitchfoked into the mayoralty chair something over a year ago, he equipped himself with several new brooms, some of which were warranted to go into the evils of city government (not of the reform strata), full as deep as the snout of a Berkshire boar in good healthy fettle. Of course, the practices of the Haverhill Gas Company were, through exceeding heinousness in his sight, those that appealed to him first, so flop went the 'investigating broom.' To be sure Moulton and his Councilmen knew litt le about gas manufacture and distribution in a sense that was practical; although they did know that the local Gas Company was 'doing' the city and its citizens to the utmost limit. So it was necessary to secure an 'expert' or 'experts' to show them in the concrete that which was going on in the gas field in the abstract, and the 'experts' retained were George W. Anderson and the great and only Prof. Alton D. Adams. From time immemorial it is customary that the dancers pay the fiddlers, and now that the dancing is done, it becomes necessary to pay the musicians, and the leader (Mr. Anderson) has submitted his bill, while the Herr. Professor (Mr. Adams) account will soon be handed in. To explain the case at length I inclose you this story, from Haverhill, under date of the 28th ult.:

"Geo. W. Anderson, who was retained by the Municipal Council 1 year ago as special counsel for the city in the hearings before the Massachusetts State Board of Gas and Electric Light Commissioners, in opposition to a new capitalization for the Haverhill Gas Company and for a reduction in the price of gas, has filed a bill for $3,723.35, with City Clerk Roberts. The bill calls for $2,700 for services at the hearings, the balance being for work in connection with cases. It caused much talk amongst the members of the Municipal Council, and the only comment that Mayor Moulton would make on it was that 'Mr. Anderson would get all that he was entitled to.' Among the Aldermen the opinion prevailed that there were items in the bill which would require explanation before they were approved. One item is $715.75 for stenographic work, and another is for $263.65 for printing in pamphlet form the argument of Mr. Anderson which is now being circulated. Mr. Anderson wrote the Municipal Council when his name was suggested that he would accept the berth of special council for $150 per day, and an order was passed for the employment of counsel at an expense not exceeding $1,000. Later, another order was passed permitting the employment of an expert engineer at an expense not exceeding $1,000, but no bill has as yet been received from Alton D. Adams, who was retained."

As the Adams bill of particulars will certainly call for a payment of not less than $2,500—if Anderson is entitled to $3,700, Adams is probably entitled to our estimated sum—the city will have, say, $7,000 to put out for which it will not have gained a single substantial thing. Unless it be that, for a time, the credit of that sterling corporation—the Haverhill Gas Company—was a bit under a cloud.

Mr. Earl Negley, of the Canton (Ills.) Gas and Electric Light Company, has about convinced the authorities of the not-far-away settlement of Cuba, that the people of the latter place would be benefitted if permission were granted the Company to pipe the streets for a gas supply.

At the annual meeting of the Winsted (Conn.) Gas Company, the officers elected were: Directors, Jas. M. Travis, R. E. Holmes, Harry Skinner, Edward Clark, M. H. Tanner, Irving B. Griswold, E. B. Parsons; President, R. E. Holmes; Secretary, F. M. Travis; Treasurer, H. Skinner.

"B.," writing from Manchester, N. H., under date of the 1st inst., says "That Manchester can boast of the finest specimen of 'Great White Way' to be seen in this country. It consists of 32 single posts, carrying one No. 5 burner, Humphrey incandescent arc. The posts are spaced 35 feet apart. The competitor in the electric end is also a subscriber to the show, in that one of these arcs is planted in front of the Electric Company's office. The electricians had simply to bow before and accept the mandate of popular opinion, and that they did so in a spirit of good fellowship is creditable alike to them and to the personality as well of the Manager of the Peoples Gas Light Company, Mr. Walter G. Africa, whose offices in this undertaking were of the squarest and fairest, a combination impossible to defeat in any line of effort. Mr. Aaron, of the Company's Commercial Department, whose continuity in the matter of attention to detail, and whose enthusiasm in putting out this installation were deciding factors in the ultimate detailed success, deserves great credit for his work in carrying out the installation to a successful conclusion. Nor was this done without getting over what at first seemed odd obstacles. The results have been so good that the business centers in New England are saying, 'Look at what Manchester has done!'"

"B.," in an additional chapter writes: "At a meeting of the New England Section of the National Commercial Gas Association, Mr. J. P. Conroy, New York representative of the General Gas Light Company, read a paper on gas arc lighting, that was at once interesting and instructive. Mr. Conroy very forcibly and clearly expressed his opinion in the matter of various single-unit installations. In supporting proof of his general statements many lantern slides of various lighting appliance curves were shown. All-in-all it was a most interesting lecture, and was listened to by an audience that was noteworthy for its number and representativeness. Mr. Conroy is to be further congratulated on being the proud possessor of the greatest living 'A. R. C.' When called upon to explain this possession, and being unable to so do to the satisfaction of his hearers, one can readily realize his embarassment when he was informed that the 'A. R. C.'—Alfred R. Conroy—represented the initials of his 2-year old son: who is known as "Arc" by Mr. Conroy's progressive and hustling sales' force."

A 20 per cent. reduction has been made in the selling rates for electricity in residence lighting by the Louisville (Ky.) Lighting Company, or from 10 cents to 8 cents. In the business section the charge has been for some time 5 cents. The Louisville Gas Company owns outright 68 per cent. of the capital stock of the electric concern. By-the-way, this cut, the Company estimates, will, if the difference is not changed through an increased output at the new rate, cause a decrease in receipts amounting to $29,000.

The Shippensburg (Pa.) Gas and Electric Company has ordered that hereafter the gross rate for the first 1,600 cubic feet of gas used per month will be $1.50, instead of $1.80. On quantities exceeding 1,600 cubic feet per month a further rebate is operative, the figures of which are not at hand.

A late chapter in the "struggle for information," respecting the doings of the Washington (D. C.) Gas Light Company, which seems to be mightily moving the thought of the District Commissioners, is the reply made by President Leiter to their request for specific knowledge respecting the physical state of the Company's properties. Mr. Leiter has informed the President of the Commission that the details will be forwarded as soon as the "accounting doctors" can prepare them.

The Market for Gas Securities.

The quotations for Consolidated, as between these of to-day and those of last week, show no change—139½ to 140. There was quite some trading in the shares, the bulk of which was recorded at less than 139. The Sullivan 70-cent gas rate measure at Albany is virtually as dead in fact as Mr. Sullivan's morality is live.

Brooklyn Union is a point lower than Consolidated, but the general market holds its own. In fact, both Peoples, of Chicago, and Lacledes, of St. Louis, are up a point to a point and a-half.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

FEBRUARY 5.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	139½	14 0
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	8,000,000	1,000	108	105
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,500,000	100	165	175
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102½
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	95	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	109
Standard	5,000,000	100	69	70
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	138	139 4
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	299,650	509	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	¼	¾
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed				
Gold Bonds	7,000,000	1,000	104	105¼
Cincinnati Gas and Electric				
Co.	29,500,000	100	87	90
Columbus (O.) Gas Co., 1st				
Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. &				
Heating Co.	1,682,750	100	90½	91
Preferred	3,036,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	13,480,084	—		—
Mortgages, 5's	3,400,000	—		—
General Mortgage 4½	10,661,000	—		—
Con. Gas Co., Baltimore				
City, 4½	2,751,000	—		—
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	94	96
Bonds	75,000	—	—	100
Detroit City Gas Co.	6,580,000	—	—	50
Detroit Gas Co., 5's	881,000	1,000	75	80
" Prior Lien 5's	5,619,000	1,000	97	100½
Equitable Gas & Fuel Co.,				
Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	183	186
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co.,				
1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of				
New Jersey	10,500,000	—	130	132
" Bonds, 5's	10,500,000	—	104	106
Indianapolis	2,000,000	—	—	38
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	88	—
" 1st Mtg. 5's	290,000	1,000	91	95
Kansas City Gas Light Co.,				
of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	99	102
Laclede Gas Co., St. Louis.	10,000,000	100	106	106¾
Preferred	2,500,000	100	114	120
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	108¾
Massachusetts Gas Compan-				
ies, of Boston	25,000,000	100	90¾	91
Preferred	25,000,000	100	95½	96
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	106½	106½
1st Mortgage	20,100,000	1,000	102	102½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105¼
Pacific Gas and Electric Co.	15,500,000	—	5½	55
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	94	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	410	415
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October 16 to 18, 1912. Atlantic City, N. J. Officers: President, Ira C. Copley, Aurora, Ills. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting, ———— Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 1912. Officers: President, R. M. Searle, Rochester, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street, New York City.

Guild of Gas Managers of New England.—Annual meeting, March, 1912. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, time, March 20 and 21, 1912, Auditorium Hotel, Chicago, Ills. Officers: President, C. B. Strohn, Elgin, Ills.; Secretary-Treasurer, F. E. Newberry, Dixon, Ills.

Illuminating Engineering Society.—Annual meeting, Sept. ————1912, ———— Meetings of Sections, monthly. Pres't, A. E. Kennelly, Boston, Mass.; Secretary, Preston S. Millar, 29 W. 39th street, N. Y. City. Sections: New York, Secretary, Albert J. Marshall, 16 East 40th street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, A. L. Eustice, 105 North Wabash avenue.

Indiana Gas Association.—Annual meeting, March, 1913, Indianapolis. Officers: President, Howard L. Olds, Indianapolis; Vice-President, Wm. Wallace, Lafayette; Secretary-Treasurer, Phumer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, time, May, ——, 1912; Lincoln, Neb. Officers: President, G. W. Clabaugh, Omaha, Neb.; Secretary and Treasurer, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, time, Sept. 1912. Manhattan, Kas. Officers: President, B. F. Eyer, Manhattan, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association—Annual meeting, time, Sept. ————1912;———— Officers: President, F. W. Blowers, Kalamazoo, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1912; St. Louis, Mo. Officers: President, F. E. Murray, Louisiana, Mo.; Secretary and Treasurer, N. J. Cunningham, Springfield, Mo.

National Commercial Gas Association.—Annual meeting, December, 1912. Atlanta, Ga. Officers: President, C. L. Holman, St. Louis, Mo.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, May, 1912, Kansas City, Mo.; Officers: President, A. B. Macbeth, Independence, Kas. Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, 14th and 15th, 1912 Boston. Officers: President, J. A. Coffin, Gloucester, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—President, William H. Pettes, Newark, N. J.; Secretary-Treasurer, Arthur H. Osborn, Belmar, N. J.

Ohio Gas Association.—Annual meeting, February 6 and 7, 1912, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary-Treasurer, T. C. Jones, Delaware, O.

Oklahoma Gas, Electric and Railway Association.—President, Noel R. Gascho, Alva Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, Sept. ————1912, ———— Officers: President, W. Baurhyte, Los Angeles, Cal.; Vice-President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, John A. Britton, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, Williamsport, Pa., April 8-10, 1912. Officers, President, C. W. Butterworth, Philadelphia, Pa.; Secretary-Treasurer, William H. Merritt Lebanon, Pa.

Society of Gas Lighting.—Annual meeting, Dec., 13, 1912; monthly meeting, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 254 West 39th street, New York city.

Southern Gas Association.—Annual meeting, April 17-19, 1912, Jacksonville, Fla. Officers: President, H. B. Hoyt, Jacksonville, Fla.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. April 25, 26, 27, 1912 San Antonio, Tex. Officers: President, J. E. Carroll, Beaumont, Tex.; Secretary, D G. Fisher, Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 15 and 16, 1912, Milwaukee, Wis. Officers: President, H. M. Buck, Waukesha, Wis.; Secretary-Treasurer, Henry Harmon. Milwaukee, Wis.